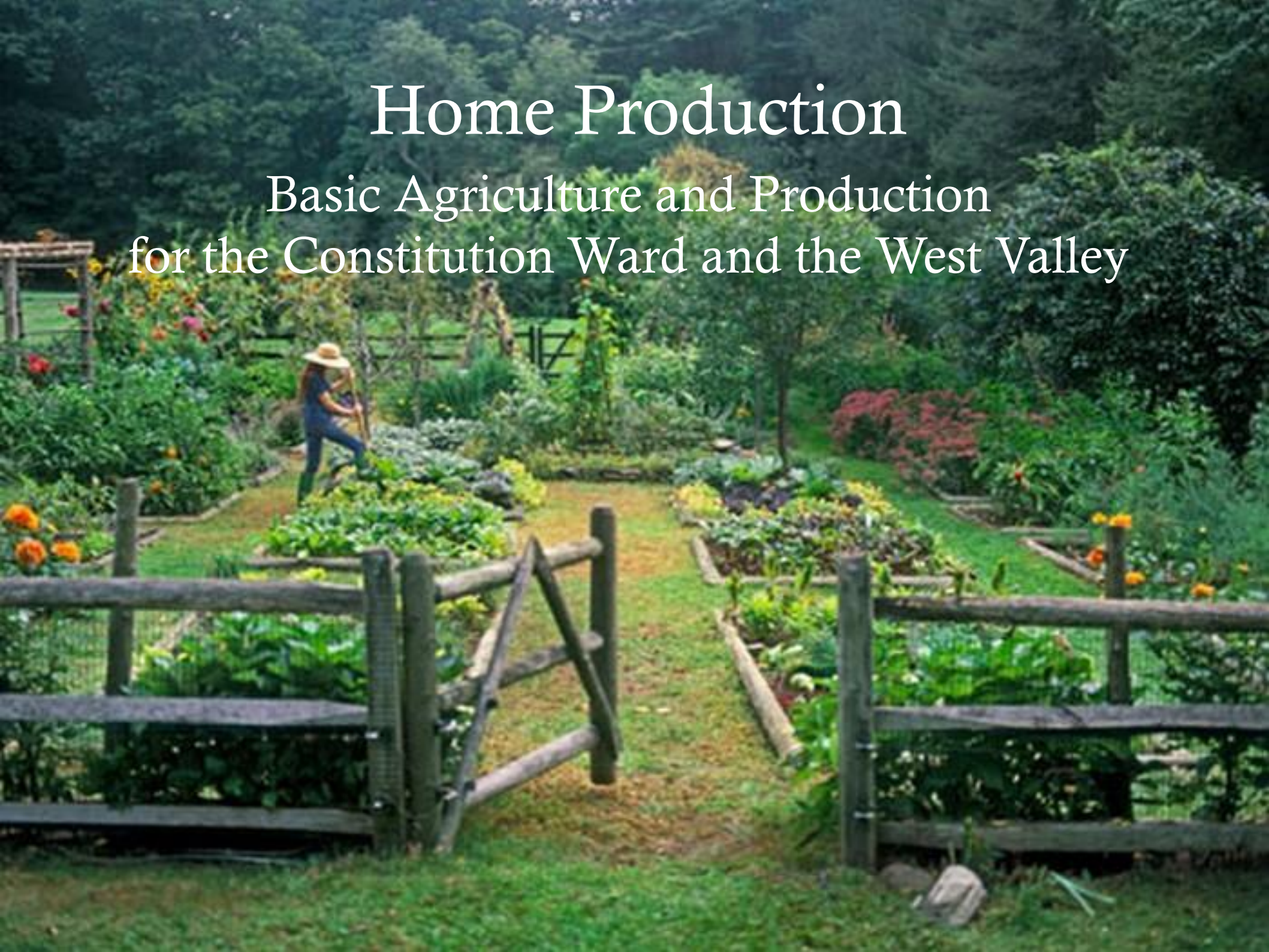


Home Production

Basic Agriculture and Production
for the Constitution Ward and the West Valley



Use It Up, Wear It Out

Build It Strong, Build It Stout

Make Do, or Do Without

We cannot prepare for everything on
our own.

We do need Our Lord, Jesus Christ
and His Church, along with our
community and family to maintain
basic needs.

I do not compose this primer for doomsday prepping. This primer is also not for sale or commercial gain – all images are the property of the copyright holders and used under fair use for education purposes only. Preparation for the worst is commendable, but my reason is for making life in our homes, families, Ward, and Stake in West Valley City a Zion for The Lord. Ours is a practical faith; Our Lord, Jesus Christ does not sow confusion, panic, and fear. The basics of life, both spiritual and temporal, follow along these lines.

We have much of what we need to care for ourselves while participating in the public square and markets. Producing at home and consuming at home is an act of savings, a means of multiplying talents, a way to bless each other, and create a sense of humble accomplishment within the individual that can be beneficial to self and others.

We are commanded to give of our excess to help our poor and needy. “Every man according as he purposeth in his heart, so let him give; not grudgingly, or of necessity: for God loveth a cheerful giver” (2 Corinthians 9:7). By increasing your production at home, your material goods will increase and so can your charitable works.

When learning new skills and testing new ideas, it is necessary to do so with a humble and open heart, to have the Holy Ghost there as a teacher and friend, to involve your family as apprentices and teachers, and to be open to teaching one another and expanding our knowledge...

We also end up with an economically thriving community and plenty of good cooking, which is always appreciated!

~ An elder, one of many

Words from the Brethren

“We are most grateful for the excellent response by the people of the Church to our urging that gardens be planted and that fruit trees be cultivated and our places cleaned up and made more livable.”

- Spencer W. Kimball (1976)

“I do not want to be a calamity howler. I don’t know in detail what’s going to happen in the future. I know what the prophets have predicted. But I tell you that the welfare program, organized to enable us to take care of our own needs, has not yet performed the function that it was set up to perform. We will see the day when we will live on what we produce.

“We’re living in the latter days. We’re living in the days the prophets have told about from the time of Enoch to the present day. We are living in the era just preceding the second advent of the Lord Jesus Christ. We are told to so prepare and live that we can be ... independent of every other creature beneath the celestial kingdom. That is what we are to do.”

-Marion G. Romney (1972)

“We encourage you to be more self-reliant so that, as the Lord has declared, “notwithstanding the tribulation which shall descend upon you, ... the church may stand independent above all other creatures beneath the celestial world” (D&C 78:14). The Lord wants us to be independent and self-reliant because these will be days of tribulation. He has warned and forewarned us of the eventuality.”

- Ezra Taft Benson (1980)

“We encourage you to grow all the food that you feasibly can on your own property. Berry bushes, grapevines, fruit trees—plant them if your climate is right for their growth. Grow vegetables and eat them from your own yard. Even those residing in apartments or condominiums can generally grow a little food in pots and planters. Study the best methods of providing your own foods. Make your garden ... neat and attractive as well as productive. If there are children in your home, involve them in the process with assigned responsibilities” (in Conference Report, Apr. 1976, 170–71; or Ensign, May 1976, 124).

The purpose of our life should be to build up the Zion of our God, to gather the House of Israel, bring in the fulness of the Gentiles, restore and bless the earth with our ability and make it as the Garden of Eden, store up treasures of knowledge and wisdom in our own understandings, purify our own hearts and prepare a people to meet the Lord when he comes (*DBY*, 88).

We have no business here other than to build up and establish the Zion of God. It must be done according to the will and law of God [see D&C 105:5], after that pattern and order by which Enoch built up and perfected the former-day Zion, which was taken away to heaven, hence the saying went abroad that Zion had fled [see Moses 7:69]. By and by it will come back again, and as Enoch prepared his people to be worthy of translation, so we, through our faithfulness, must prepare ourselves to meet Zion from above when it shall return to earth, and to abide the brightness and glory of its coming (*DBY*, 443).

We look forward to the day when the Lord will prepare for the building of the New Jerusalem, preparatory to the City of Enoch's going to be joined with it when it is built upon this earth [see Moses 7:62–64]. We are anticipating to enjoy that day, whether we sleep in death previous to that, or not. We look forward, with all the anticipation and confidence that children can possess in a parent, that we shall be there when Jesus comes; and if we are not there, we will come with him: in either case we shall be there when he comes (*DBY*, 120).

We have been gathered ... for the express purpose of purifying ourselves, that we may become polished stones in the temple of God. We are here for the purpose of establishing the Kingdom of God on the earth. To be prepared for this work it has been necessary to gather us out from the nations and countries of the world [to receive] the ordinances of the holy Priesthood of the Son of God, which are necessary for the perfection of the Saints preparatory to his coming (*DBY*, 121).

The ordinance of sealing must be performed here [son] to [father], and woman to man, and children to parents, etc, until the chain of generation is made perfect in the sealing ordinances back to Father Adam; hence, we have been commanded to gather ourselves together, to come out of Babylon [see D&C 133:5, 7, 14], and sanctify ourselves, and build up the Zion of our God, by building cities and temples, redeeming countries from the solitude of nature, until the earth is sanctified and prepared for the residence of God and angels (*DBY*, 407).

Do we realize that if we enjoy a Zion in time or in eternity we must make it for ourselves? That all, who have a Zion in the eternities of the Gods, organized, framed, consolidated, and perfected it themselves, and consequently are entitled to enjoy it? (*DBY*, 118).

When we conclude to make a Zion we will make it, and this work commences in the heart of each person. When the father of a family wishes to make a Zion in his own house, he must take the lead in this good work, which it is impossible for him to do unless he himself possesses the spirit of Zion. Before he can produce the work of sanctification in his family, he must sanctify himself, and by this means God can help him to sanctify his family (*DBY*, 118).

The Lord has done his share of the work; he has surrounded us with elements containing wheat, meat, flax, wool, silk, fruit, and everything with which to build up, beautify and glorify the Zion of the last days, and it is our business to mould these elements to our wants and necessities, according to the knowledge we now have and the wisdom we can obtain from the heavens through our faithfulness. In this way will the Lord bring again Zion upon the earth, and in no other (*DBY*, 294). There is not one thing wanting in all the works of God's hands to make a Zion upon the earth when the people conclude to make it. We can make a Zion of God on earth at our pleasure, upon the same principle that we can raise a field of wheat, or build and inhabit. There has been no time when the material has not been here from which to produce corn, wheat, etc, and by the judicious management and arrangement of this ever-existing material a Zion of God can always be built on the earth (*DBY*, 118).

We want all the Latter-day Saints to understand how to build up Zion. The City of Zion, in beauty and magnificence, will outstrip anything that is now known upon the earth. The curse will be taken from the earth and sin and corruption will be swept from its face. Who will do this great work? Is the Lord going to convince the people that he will redeem the center Stake of Zion, beautify it and then place them there without an exertion on their part? No. He will not come here to build a Temple, a Tabernacle, a Bowery, or to set out fruit trees, make aprons of fig leaves or coats of skins, or work in brass and iron, for we already know how to do these things. ... We have to build up Zion, if we do our duty (*DBY*, 120).

I see men and women in this congregation—only a few of them—who were driven from the central Stake of Zion [in Jackson County, Missouri; see D&C 57:2–3]. Ask them if they had any sorrow or trouble; then let them look at the beautiful land that the Lord would have given them if all had been faithful in keeping his commandments, and had walked before him as they should; and then ask them with regard to the blessings they would have received. If they tell you the sentiments of their minds, they will tell you that the yoke of Jesus would have been easy and his burden would have been light, and that it would have been a delightful task to have walked in obedience to his commandments and to have been of one heart and one mind; but through the selfishness of some, which is idolatry, through their covetousness, which is the same, and the lustful desire of their minds, they were cast out and driven from their homes (*DBY*, 113–14).

Let us train our minds until we delight in that which is good, lovely and holy, seeking continually after that intelligence which will enable us effectually to build up Zion, which consists in building houses, tabernacles, temples, streets, and every convenience and necessity to embellish and beautify, seeking to do the will of the Lord all the days of our lives, improving our minds in all scientific and mechanical knowledge, seeking diligently to understand the great design and plan of all created things, that we may know what to do with our lives and how to improve upon the facilities placed within our reach (*DBY*, 247).

We have come here to build up Zion. How shall we do it? ... We have got to be united in our efforts.

We should go to work with a united faith like the heart of one man; and whatever we do should be performed in the name of the Lord, and we will then be blessed and prospered in all we do. We have a work on hand whose magnitude can hardly be told (*DBY*, 284).

Many Latter-day Saints think when they have obeyed the Gospel, made a sacrifice in forsaking their homes, perhaps their parents, husbands, wives, children, farms, native lands, or other things held dear, that the work is done; but it is only just commenced. The work of purifying ourselves and preparing to build up the Zion of God ... has only just begun with us when we have got as far as that (*DBY*, 444).

Everything connected with building up Zion requires actual, severe labor. It is nonsense to talk about building up any kingdom except by labor; it requires the labor of every part of our organization, whether it be mental, physical, or spiritual, and that is the only way to build up the Kingdom of God (*DBY*, 291).

If we are to build up the Kingdom of God, or establish Zion upon the earth, we have to labor with our hands, plan with our minds, and devise ways and means to accomplish that object (*DBY*, 291).

I have Zion in my view constantly. We are not going to wait for angels, or for Enoch and his company to come and build up Zion, but we are going to build it. We will raise our wheat, build our houses, fence our farms, plant our vineyards and orchards, and produce everything that will make our bodies comfortable and happy, and in this manner we intend to build up Zion on the earth and purify it and cleanse it from all pollutions. Let there be an hallowed influence go from us over all things over which we have any power; over the soil we cultivate, over the houses we build, and over everything we possess; and if we cease to hold fellowship with that which is corrupt and establish the Zion of God in our hearts, in our own houses, in our cities, and throughout our country, we shall ultimately overcome the earth, for we are the lords of the earth; and, instead of thorns and thistles, every useful plant that is good for the food of man and to beautify and adorn will spring from its bosom (*DBY*, 443–44).

The Lord has blessed me; he has always blessed me; from the time I commenced to build up Zion, I have been extremely blessed. I could relate circumstances of so extraordinary a character in regard to the providences of God to me, that my brethren and sisters would say in their hearts, “I can hardly give credence to this” (*DBY*, 452).

My spiritual enjoyment must be obtained by my own life, but it would add much to the comfort of the community, and to my happiness, as one with them, if every man and woman would live their religion, and enjoy the light and glory of the Gospel for themselves, be passive, humble and faithful; rejoice continually before the Lord, attend to the business they are called to do, and be sure never to do anything wrong (*DBY*, 119).

All would then be peace, joy, and tranquility, in our streets and in our houses. Litigation would cease, there would be no difficulties before the High Council and Bishops’ Courts, and courts, turmoil, and strife would not be known (*DBY*, 119).

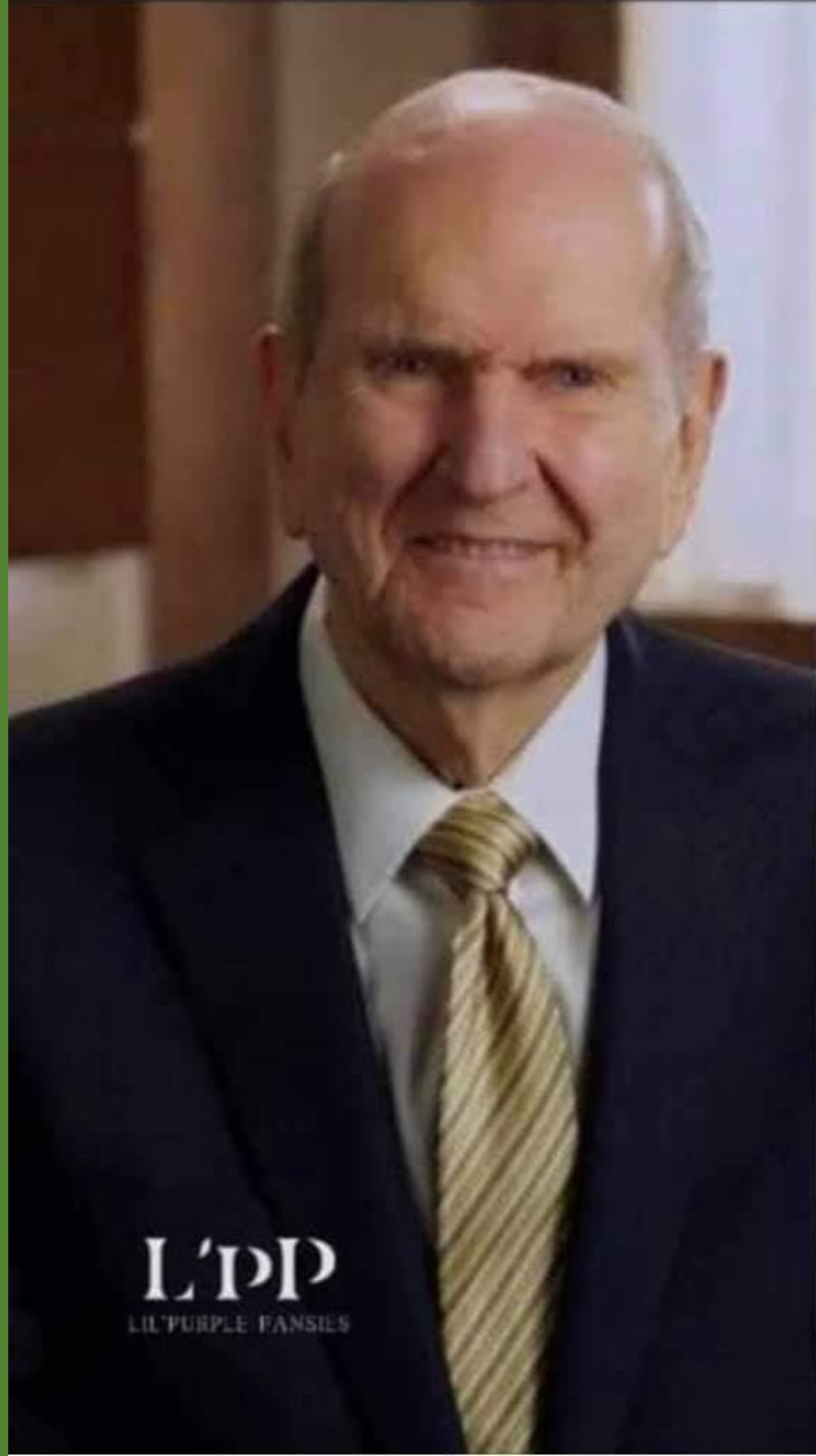
Then we would have Zion, for all would be pure in heart (*DBY*, 119).

My heart has been set in me to do the will of God, to build up his Kingdom on the earth, to establish Zion and its laws, and to save the people; and I can say, truly and honestly, that the thought never came into my mind, in all my labors, what my reward will be, or whether my crown would be large or small, or any crown at all, a small possession, a large possession, or no possession. I have never had any thoughts or reflections upon this, or cared the first thing about it. All that I have had in my mind has been that it was my duty to do the will of God, and to labor to establish his Kingdom on the earth ... because the principles which God has revealed for the salvation of the inhabitants of the earth are pure, holy and exalting in their nature. In them there is honor and eternal increase, they lead on from light to light, strength to strength, glory to glory, knowledge to knowledge, and power to power (*DBY*, 452).

“For behold, ye do love money, and your substance, and your fine apparel, and the adorning of your churches, more than ye love the poor and the needy, the sick and the afflicted.”
(Morm. 8:35, 37.)

This state of affairs stands in marked contrast to the Zion the Lord seeks to establish through his covenant people. Zion can be built up only among those who are the pure in heart—not a people torn by covetousness or greed, but a pure and selfless people, not a people who are pure in appearance, rather a people who are pure in heart. Zion is to be in the world and not of the world, not dulled by a sense of carnal security, nor paralyzed by materialism. No, Zion is not things of the lower, but of the higher order, things that exalt the mind and sanctify the heart.

Zion is “every man seeking the interest of his neighbor, and doing all things with an eye single to the glory of God.”
(D&C 82:19.) As I understand these matters, Zion can be established only by those who are pure in heart, and who labor for Zion, for “the laborer in Zion shall labor for Zion; for if they labor for money they shall perish.” (2 Ne. 26:31.)



RUSSELL M. NELSON

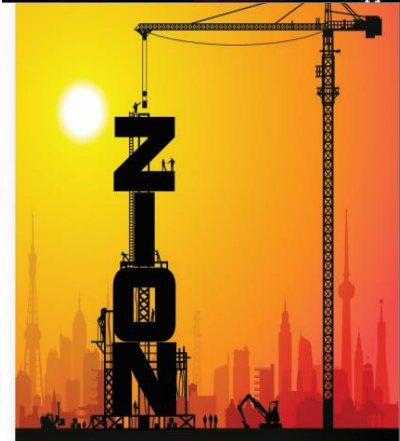
“Difficult days are ahead. Rarely in the future will it be easy or popular to be a faithful Latter-day Saint. Each of us will be tested. The Apostle Paul warned that in the latter days, those who diligently follow the Lord “shall suffer persecution.” That very persecution can either crush you into silent weakness or motivate you to be more exemplary and courageous in your daily lives.”

L'PP
LIL'PURPLE FANSIES

Face the Future with Faith | April 2020 | General Conference

Why We Grow Food

- Part of Establishing Zion
- Provide for the needy
- Living Providently
- Provide for the larder
- Improve health
- Good exercise
- Resist shortages
- Resist inflation
- Increase income



How Gardening Fights High Food Costs/Inflation

Growing Your Own Vegetables

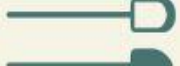
Renting an allotment for a year - an average of **£35**
Investment in the tools and equipment you will need:



Wheelbarrow - £39.98



Rake - £14.98



Hoe - £14.98



Spade and Fork - £19.19



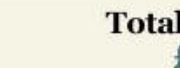
Secateurs - £9.98



Trowel - £5.98



Hand fork - £5.98



Compost 125l - £7.48

**Total Cost of Tools
£118.55**

Eating At A Carvery



Average cost of one carvery is **£5.95**, so to feed a family of four on a Sunday it would cost **£23.80 per week**

Total yearly cost to have a carvery every week for a family of four

£1237.60

Sunday Roast: Grow Your Own Vegetables

Is growing your vegetables really cheaper than buying them from a supermarket? And how does it compare to eating a carvery every weekend?



Growing Your Own Vegetables



Potatoes - Maris Piper 12 Tuber Pack **£1.99** (enough for a 12ft row or 3-4 potato planters)



Broccoli - 1 pack of 100 seeds costs **£2.00**



Peas - 1 pack of 200 seeds costs **£0.95**



Carrots - 1 pack of 2000 seeds costs **£0.95**



Cauliflower - 1 pack of 250 seeds costs **£0.95**

**Total Cost of Seeds
£6.84**

Total yearly cost to grow your own vegetables for a Sunday Roast

£125.39

Buying From A Supermarket

Think of all the money you could save if you grew your own vegetables for every meal!



Potatoes
2.5kg bag - **£1.90**



Broccoli
335g - **£0.97**



Peas
Frozen garden peas 1kg - **£1.40**



Carrots
1.2kg bag - **£1.00**



Cauliflower
335g - **£1.00**

Total yearly cost to buy your own vegetables for a Sunday Roast

£326.04

Home Gardening

Don't just go local,
grow local.

American food garden sizes



Median food garden size:

96 square feet

Average food garden size:

600 square feet

Regional breakdown of American food gardeners



Female 54%

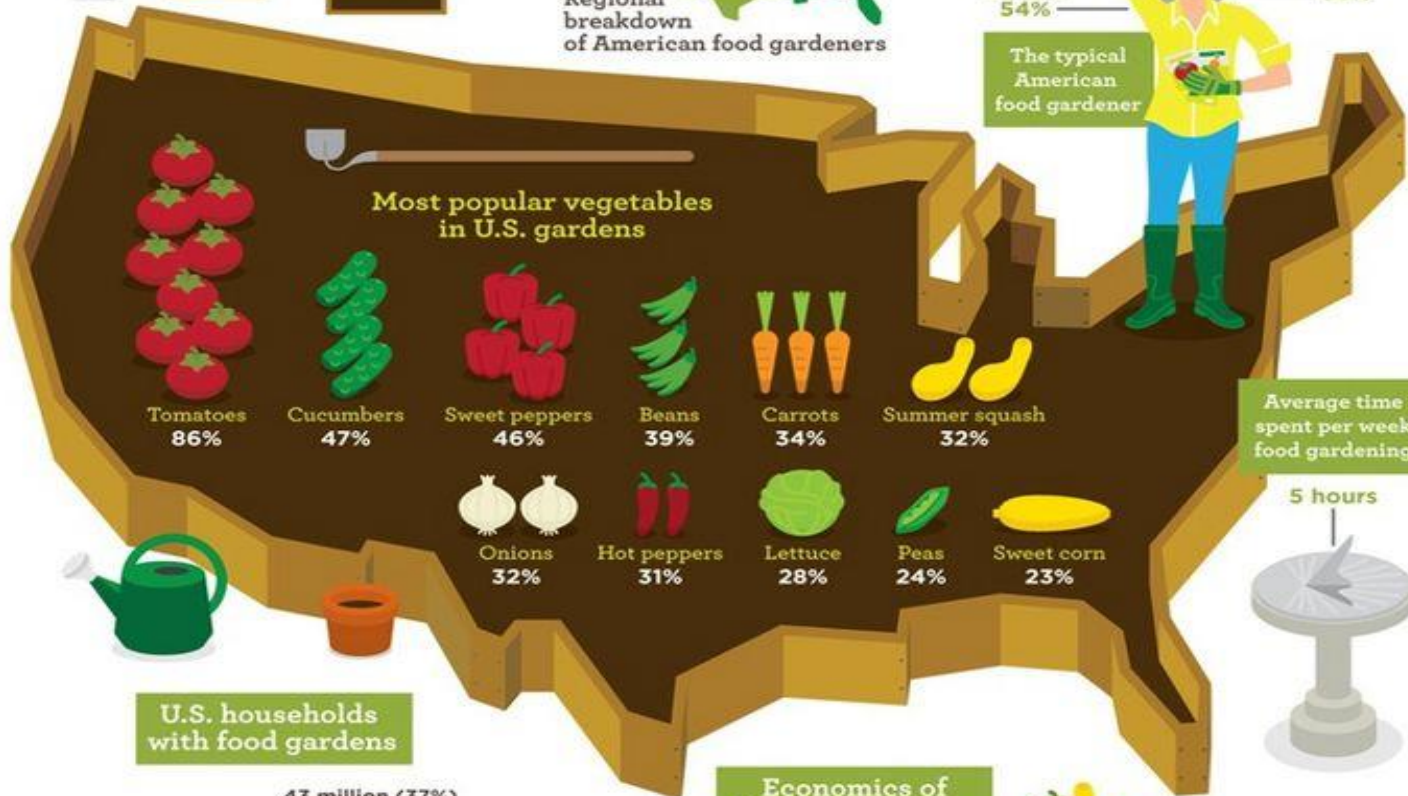
College graduate or some college 79%

45 and older 68%

The typical American food gardener



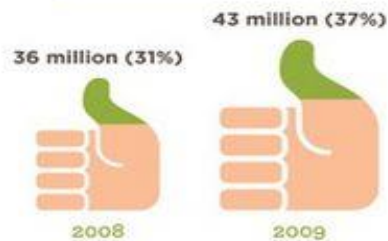
Most popular vegetables in U.S. gardens



Average time spent per week food gardening

5 hours

U.S. households with food gardens



21% of those households in 2009 were new to gardening

Economics of U.S. food gardens

2008 data



Total spent nationwide: \$2.5 billion



Total return on investment: \$21 billion

Estimated dollar return for a 600 sq. ft. garden \$600

Average spent per household: \$70

Average food gardening return on investment: \$530

Source: National Gardening Association

Infographic: Russell McLendon/MNN
Design: Chris Rooney (@looneyrooneycom)/MNN



Basic Food Storage Amounts

Recommended from the Church's Home Storage Center

For One Year per Person:

- .400 lbs. of Grain
- .60 lbs. of Beans/Legumes
- .60 lbs. of Sugars
- .20 lbs. of Fats
- .16 lbs. of Dry Milk
- .8 lbs. of Salt

Actual Amount Per Day:

- .1.9 lbs. Grain/Flour
- .2.63 oz. of Beans/Legumes
- .2.63 oz. of Sugars
- ..87 oz. of Fats
- ..7 oz. of Dry Milk
- ..35 oz. of Salt

Food Storage will only go so far as to keep a person alive, but not active; gardens extend and replenish a food storage program

Planning Ahead and Plant Basics

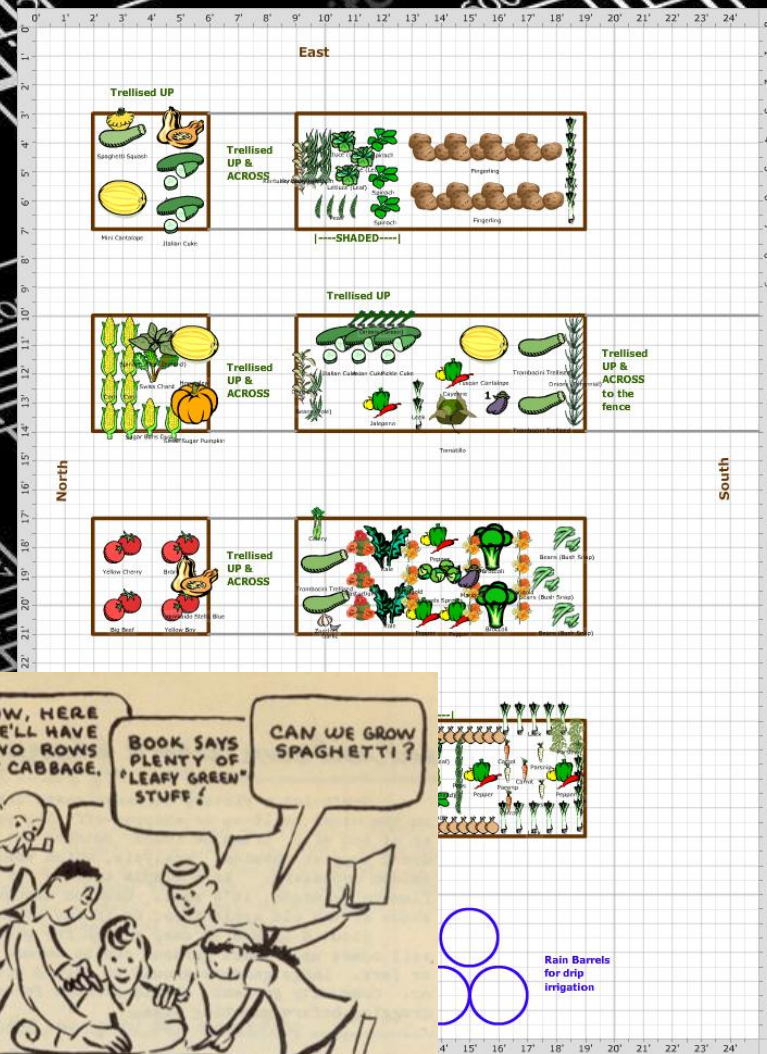
.Planning is the first key to gardening success

.In the early Spring, plan your garden for the seasons ahead

.Research how much space each plant needs, how much sunlight is needed, and if your planned garden area can provide that

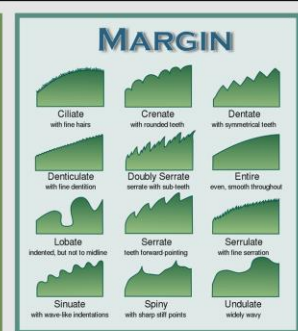
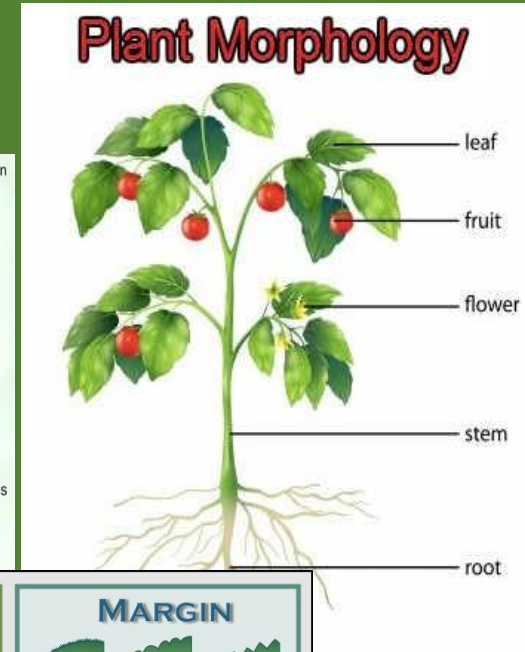
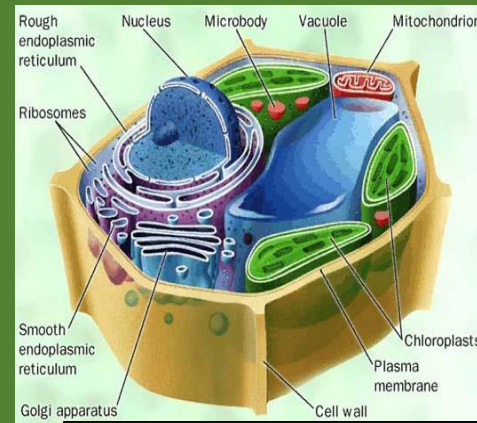
.Discuss which foods you would like to eat, which things you'd like to try

.Check what pests, varmints, and predators are in your area and deal with them first



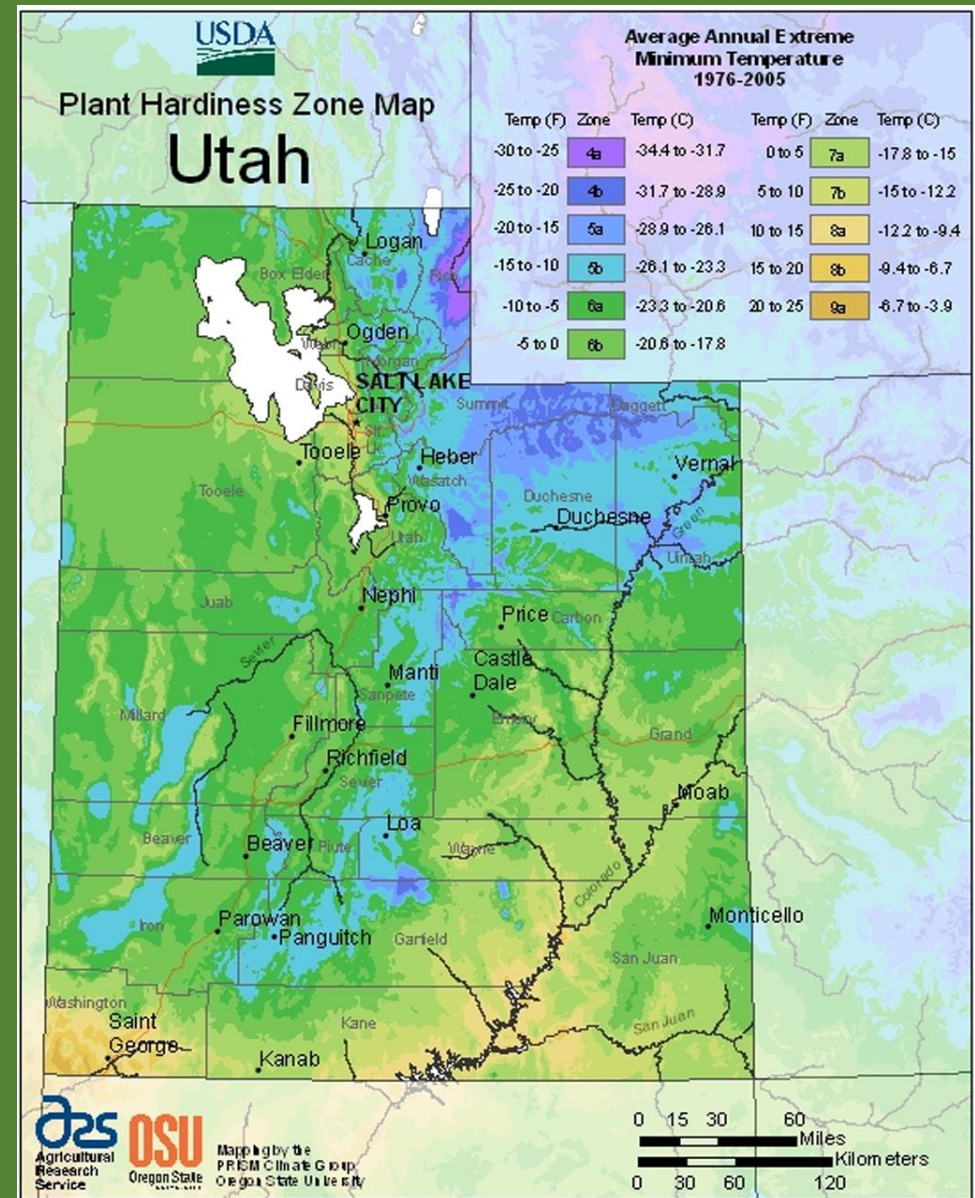
Plant Morphology

- “The vegetative (somatic) structures of vascular plants include two major organ systems: (1) a shoot system, composed of stems and leaves, and (2) a root system. These two systems are common to nearly all vascular plants, and provide a unifying theme for the study of plant morphology.
- By contrast, the reproductive structures are varied, and are usually specific to a particular group of plants. Structures such as flowers and fruits are only found in the angiosperms; sori are only found in ferns; and seed cones are only found in conifers and other gymnosperms. Reproductive characters are therefore regarded as more useful for the classification of plants than vegetative characters.” Wikipedia Reference
- Plants manufacture their own food (glucose) by using water, sunlight, CO₂, and nutrients



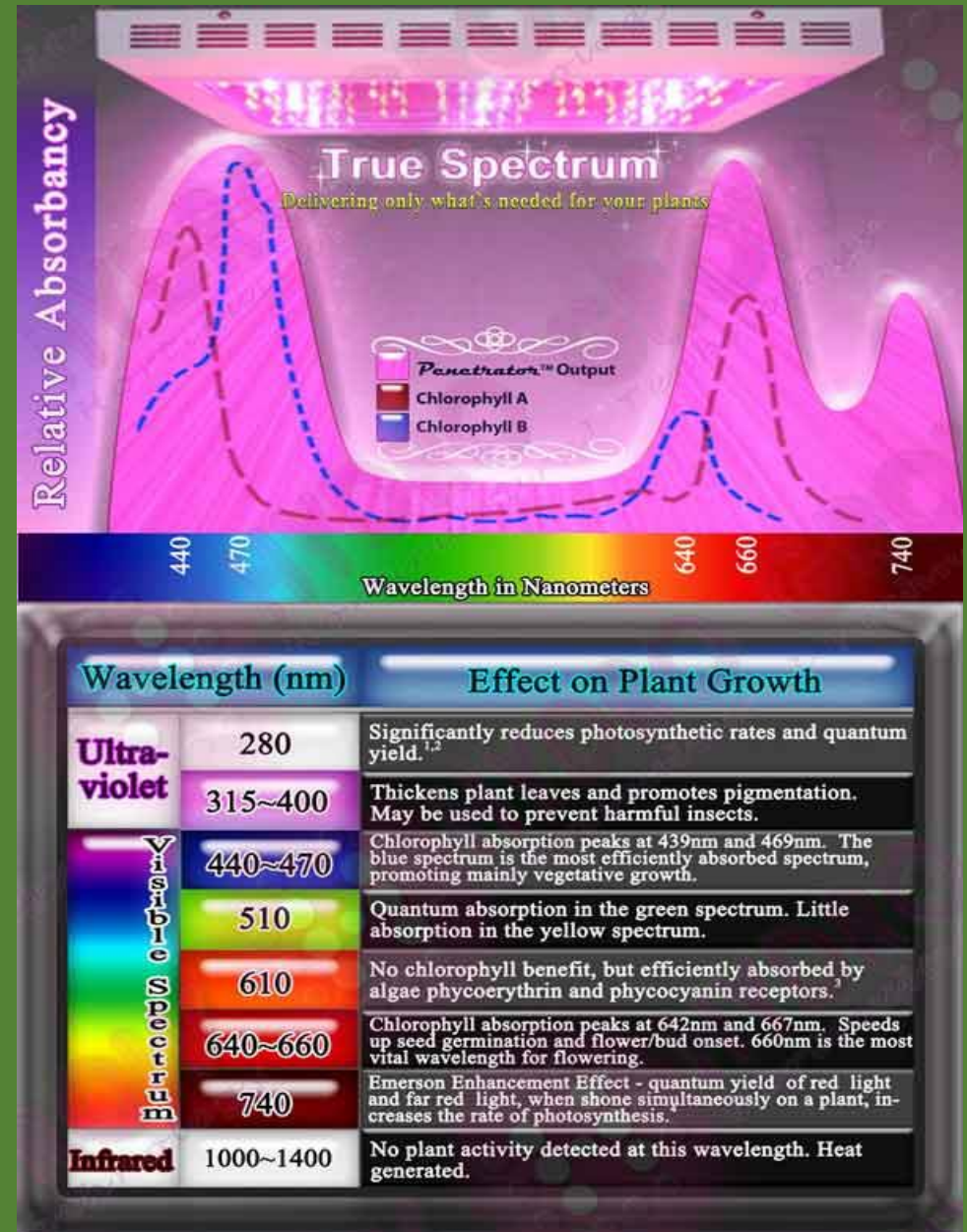
Plant Hardiness Zones

- West Valley City is hardiness zones 7a and 7b: this gives us a tolerance into 6b and possibly 8a
- Certain plants, especially perennials, will only live in certain temperature zones; outside of these zones some plants are considered annuals
- Plant Hardiness Zoning Maps help with planning what can and can't be grown outside
- Average last/first frost dates must also be considered: April 30th – September 29th for cold intolerant plants



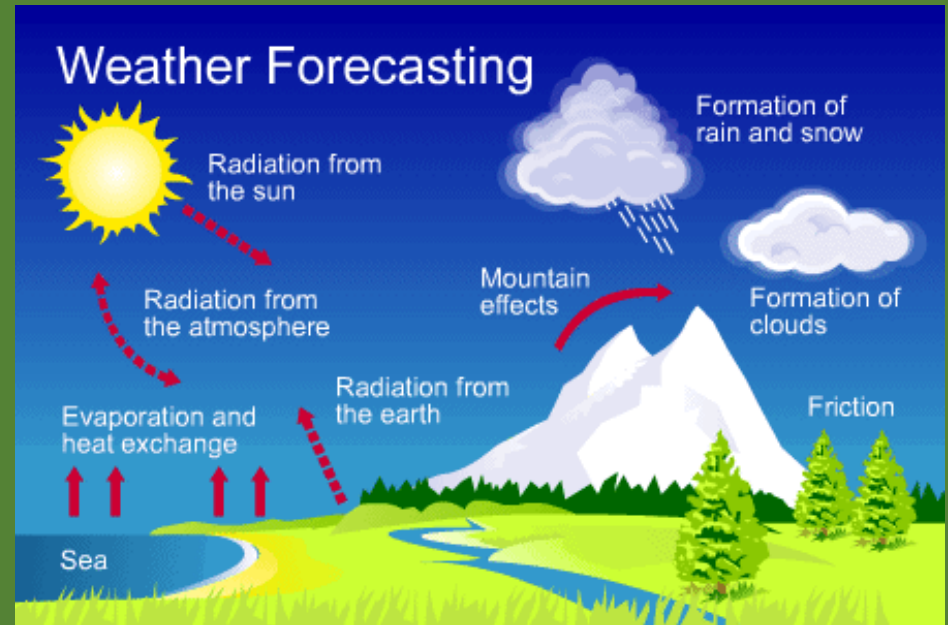
Light Requirements

- Plants use light to create their own food (glucose) through Photosynthesis
- Plants utilize visible light of the blue and red spectrum most; between that, not so much
- Check for lighting requirements of each plant type – some need full sun (6- 10 hours), part sun (3-6 hours) or shade (1-3 hours)
- Indoor plants with some indirect outside light benefit from the use of “Daylight Bulbs”; specialized lights that mimic sunlight, but are quite cool at 89F
- Plants with no access to outside light requires Metal Halide or Pressurized Sodium bulbs to grow



Weather

- Use of irrigation and other methods has reduced dependency on weather to grow gardens
- Severe weather is still an issue, and light rains are needed regardless
- High winds, sudden temperature changes, hail and early freezes ruin entire harvests
- Weather is very unpredictable, even for NOAA supercomputers
- Check 3-day forecasts and look with your own eyes to determine what must be done with your garden; look online for plans of homemade weather instruments



SKY WATCHER CHART

High Clouds: cloud bases 16,000 - 50,000ft (5-15km)

<http://www.weather.gov/os/brochures/cloudchart.pdf>

Typical Types: Cirrus (Ci), Cirrostratus (Cs), Cirrocumulus (Cc)



H1: Cirrus
In the form of filaments, strands, or hooks



H2: Cirrus
Dense, in patches or sheaves, not increasing, or with tufts



H3: Cirrus
Often anvil shaped remains of a cumulonimbus



H4: Cirrus
In hooks or filaments, increasing, becoming denser



H5: Cirrostratus
Cirrus bands, increasing, below 45° elevation



H6: Cirrostratus
Cirrus bands, increasing, veil above 45° elevation



H7: Cirrostratus
Translucent, completely covering the sky



H8: Cirrostratus
Not increasing, not covering the whole sky



H9: Cirrocumulus
Alone or with some cirrus or cirrostratus

Middle Clouds: cloud bases 6,500 - 23,000ft (2-7km)

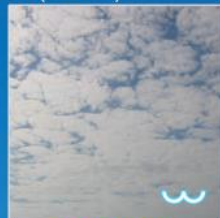
Typical Types: Altostratus (As), Altostratus (Ac), Nimbostratus (Ns)



M1: Altostratus
Mostly semi-transparent, sun or moon may be dimly visible



M2: Altostratus or Nimbostratus
Dense enough to hide the sun or moon



M3: Altostratus
Semi-transparent, one level, cloud elements change slowly



M4: Altostratus
Lens-shaped, or continually changing shape and size



M5: Altostratus
One or more bands or layers, expanding, thickening



M6: Altostratus
From the spreading of cumulus or cumulonimbus



M7: Altostratus
One or more opaque layers, w/ altostratus or nimbostratus



M8: Altostratus
With cumulus-like tufts or turrets



M9: Altostratus
Chaotic sky, cloud bases at several levels

Low Clouds: cloud bases Up to 6,500 ft (0-2km)

Typical Types: Stratus (St), Stratocumulus (Sc), Cumulus (Cu), Cumulonimbus (Cb)



L1: Cumulus
Cumulus of fair weather with flattened appearance



L2: Cumulus
Moderate/strong vertical extent, or towering cumulus



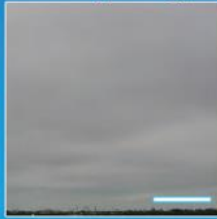
L3: Cumulonimbus
Tops not fibrous, outline not completely sharp, no anvil



L4: Stratocumulus
From the spreading and flattening of cumulus



L5: Stratocumulus
Not from the spreading and flattening of cumulus



L6: Stratus
In a continuous layer and/or ragged shreds



L7: Stratus Fractus
and/or Cumulus Fractus occurs with rain or snow



L8: Cumulus & Stratocumulus
Not spreading, bases at different levels



L9: Cumulonimbus
With fibrous top, often with an anvil



Mammatus
Drooping underside of heavy, rain-saturated clouds



Tornado
Rapidly rotating column under a cumulonimbus cloud that touches the ground



Wall Cloud
Lowering of the rain free base of a thunderstorm, often prior to tornado formation



Shelf Cloud
Represents the leading edge of strong winds in advance of a thunderstorm



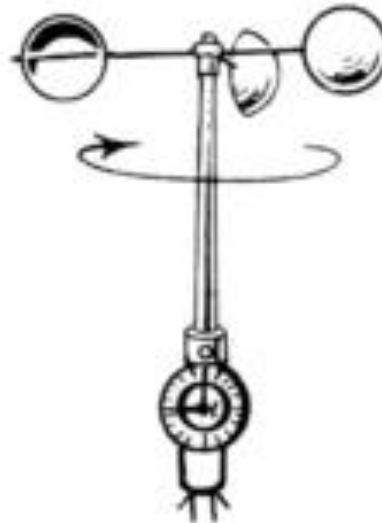
Wave Cloud
Formed by strong horizontal winds over uneven terrain

Special photo credit thanks to Jim W. Lee, Eric Kurth, Brian Klimowski, and Eric Helgeson

Weather Instruments



Thermometer
(temperature)



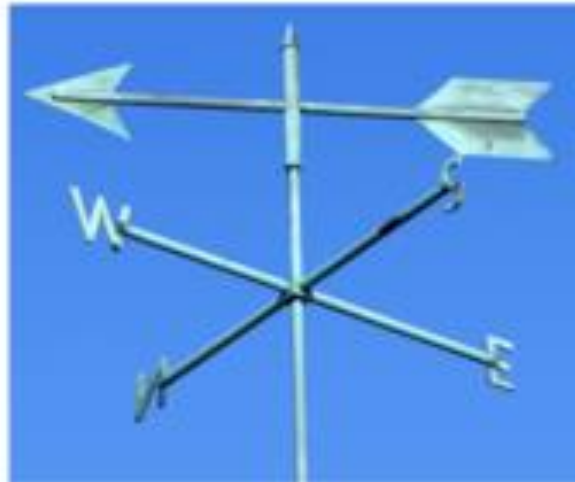
Anemometer
(wind speed)



Hygrometer
(humidity)



Rain gauge
(amount of rain)



Wind vane
(wind direction)



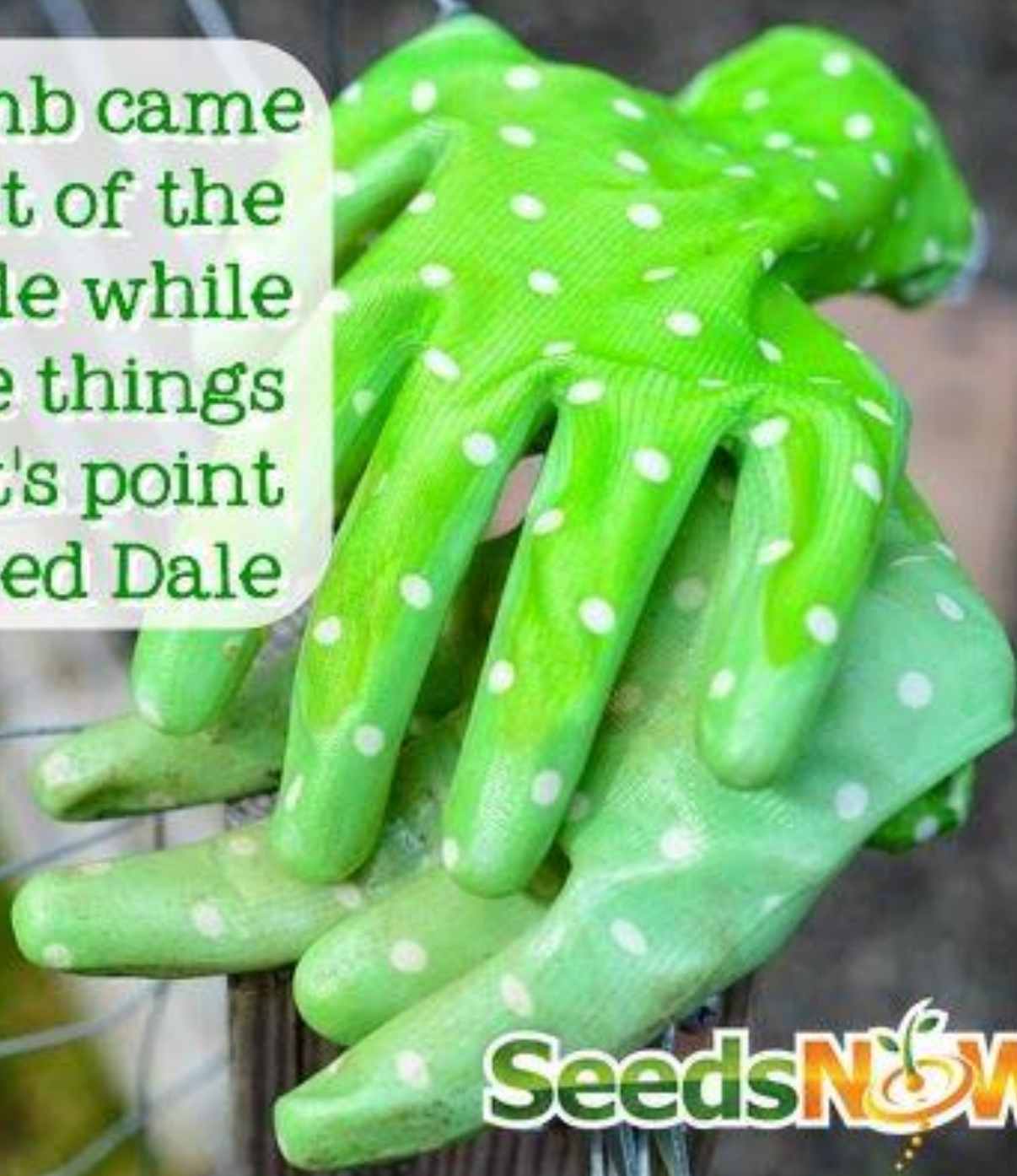
Snow gauge
(amount of snow)

Air Pollution

- Plants breathe in through their leaves most of what we consider air pollution: that's one reason why pollution is more evident in wintertime
- Plants thrive on carbon dioxide, water vapor, and particulates in the air
- Rainfall and high humidity forces the air pollutants into the soil where plants utilize it faster – that's why plants seem brighter and healthier after rainfall than with only irrigation
- Plants are harmed by ozone pollution: ozone (O_3) acts as a disinfectant to all carbon-based life; O_3 , however, decays quickly in water vapor



My green thumb came only as a result of the mistakes I made while learning to see things from the plant's point of view. ~H. Fred Dale



Methods of Gardening

- A garden must include the following: soil, water, nutrients, light, heat, and plants – any place that can supply these needs will grow food
- Raising plants is a matter of providing the plant with what it asks for – no more or less; fulfill all the plants needs and adjust where necessary, but also trust the plant to grow properly and provide you with the desired harvest
- You and the plants work as one to maximize the harvest – remember: the plant wants both of you to succeed



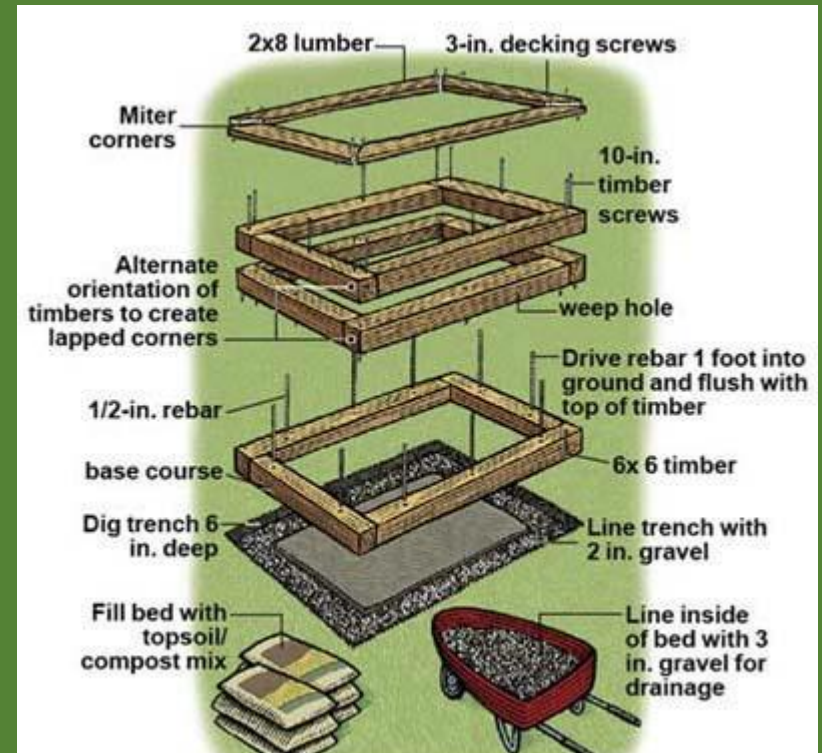
Traditional Garden

- Needs a lot of improvements to create good, arable soil (loam) such as stone and debris removal, soil conditioning, fertilizing in excess
- Grows more food per square inch than any other in-soil method; only limited by the space of the allotment; cheapest way to grow the maximum amount of foodstuffs
- The larger the garden the more power tools might be needed
- Necessary method for grains as other means either produces not enough quantity or low nutritive crops
- Not easy for wheelchairs or persons with mobility issues
- Weeding, watering, extreme weather, fertilizer dissipation, pre-existing pests and pathogens are the biggest issues



Raised Beds

- Better suited to intensive gardening techniques with hand tools such as square inch and miniature cold frame methods; elevated and easier to maneuver around for folks with mobility problems
- Necessary for places with mole problems (attach hardware cloth underneath); West Valley does have occasional moles and other varmints
- Burying strips of sod, right-side up, one foot under the topsoil will maximize garden production for decades
- A newer method of raised bed construction involves layering mulches, composts and straw to create a no-dig hot bed
- Pathways between beds will need occasional weeding and upkeep; raised beds likely will not create foods in bulk





How to Build and Install RAISED GARDEN BEDS

HERE ARE TIPS ON PLANNING, BUILDING, PROTECTING AND IRRIGATING RAISED BED GARDENS.

Bad dirt is out, because you fill a raised bed with a customized soil-and-compost blend.

Drainage is built into the bed walls, which hold the soil in place to keep erosion in check.

Greater exposure to the sun warms the bed, which allows more plant diversity and extends the growing season.

“THE SIDES CAN BE ALMOST ANY DURABLE BUILDING MATERIAL, INCLUDING ROCK, BRICK, CONCRETE AND INTERLOCKING BLOCKS.”

Water-use efficiency is maximized.

Weeds are crowded out.

Plants can be spaced closely together, so yields go up.



Container Gardens

- Helpful for those renting, have little space, or wish to maximize their space by growing where there is no soil
- Most any thoroughly cleaned container with suitable drainage can be used (be sure it did not previously contain harsh chemicals or substances; these linger with the container even after washing); also grow directly in a bag of fertilizer
- Bucket gardens, elevated beds, and growing directly in a bag of compost are popular method
- The biggest issues are drainage, mold, and insects; without good drainage you're essentially drowning your tender, young plants in a bucket; mold is inevitable – stir around the top of the soil to break it up; gnats prefer to lay their eggs in potted plant soil, so if bringing a plant indoors be ready with glue traps



DIY Two Bucket Sub-Irrigated Planter

A Sub-Irrigated Planter (SIP) is an easy to build system that allows you to easily and effectively water your vegetable plants on your roof, balcony, or fire escape.

How does it work?

The water reservoir inside of an SIP ensures that plants cannot be over watered and will only consume enough water to stay healthy. The plastic covering reduces evaporation and returns water vapor to the soil and protects the fertilizer from being washed away by rain.

Materials & Tools

- 2 five gallon food-grade buckets- must be able to stack inside one another. You can often get free-used 5 gallon buckets from any grocery store. Just call ahead to see if any are available.
- 1" plastic pipe or tubing (pvc pipe works fine) about 3" longer than the height of one of the buckets
- smaller plastic container (a used salsa or hummus container works really well)
- power drill with 1/4 inch drill bit
- box-cutter
- clear plastic or plastic bag large enough to cover the opening of one of your buckets
- snips or heavy duty scissors



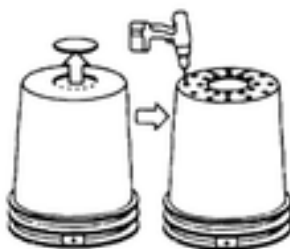
Step 1 | Measure your buckets

Stack the two buckets together and place them in front of a light source in a darkened room, allowing you to see the space created between them- this space will act as your water reservoir. Measure the height of this space and transfer this measurement to your smaller plastic container, starting from the bottom. Add 1/8" to this height and measure the diameter of your container at that height.

Step 2 | Drill your holes

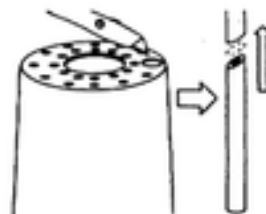
Turn the first bucket upside down and mark the center. Around the center draw a circle whose size to the diameter you just measured on your plastic container. Using this circle as a guide cut a hole in the bottom of the bucket that is just smaller than the diameter of your small plastic container. If you have a jigaw, use this to cut the hole. If not, drill a series of small holes around the perimeter of the circle and use your snips or scissors to finish the job.

On the same bucket drill roughly 25 1/4" holes evenly spaced around the larger hole you just made.



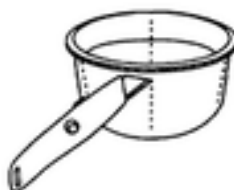
Step 3 | Drill a hole for your watering pipe and cut your tubing

Drill or cut a hole in the bottom of the bucket that corresponds to the diameter of your watering pipe or tubing. Cut the bottom of your tubing at a 45-degree angle to prevent the tube from clogging in your bucket.



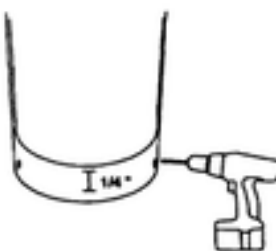
Step 4 | Cut slits in your small container

With your box cutter slice 4 vertical slits in the sides of the smaller plastic container making the slices evenly spaced around the perimeter of the cup. Do not cut through the bottom or lip of your cup.



Step 5 | Stack your buckets together and drill your overflow holes

Place the bucket with holes in it inside the other bucket. Place the buckets in front of a light source as you did earlier and drill two 1/4" overflow holes on opposite sides of the outside bucket. These holes should be a quarter inch below the bottom of the inside bucket.



Step 6 | Add your potting mix and plant your seedlings

With the buckets stacked together, place the plastic tube through the hole you made for it angled end first. Pack the small plastic container with wet potting mix and set it inside the large hole in the center of the bucket. Fill the first bucket 3/4 full with damp potting mix making it fairly compact. Plant your seedling and top off the bucket with potting mix.



Step 7 | Add the fertilizer

Water your seedling from the top, for the first and only time to saturate the soil. From then on, water your plant using the pipe. Take one cup of fertilizer and sprinkle it around the outside edge of the bucket leaving as large of a space of plain soil in the middle as possible. Take your clear plastic or plastic bag and make two slits in it, large enough to fit your seedling and watering tube through, respectively. Place the plastic over the top of your bucket while gently feeding your seedling and watering tube through the slits. Secure the plastic with a zip tie or string.



Step 8 | Watering tips

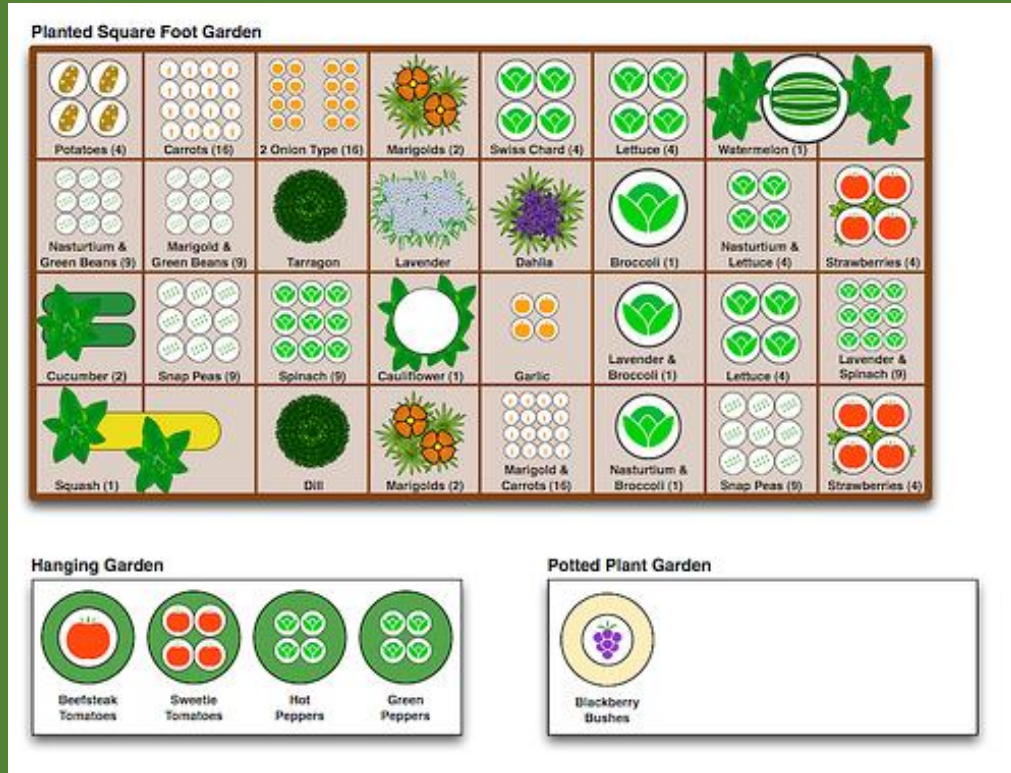
When watering fill the reservoir until water comes out of the overflow holes. With this system it is impossible to over-water your plant. Every few days take a look at your reservoir and fill as necessary.

Square-Foot Gardening

- Utilizing the raised bed method and minimum plant spacing requirements, this method produces a good amount of food in a small space

- Very labor intensive; requires a lot of preparation and sterile soil (perfectly free of weeds and pests), and attention to details; difficult to do with vine-type annuals like watermelons, squashes, and pumpkins unless the vines are trained upwards or pinched off

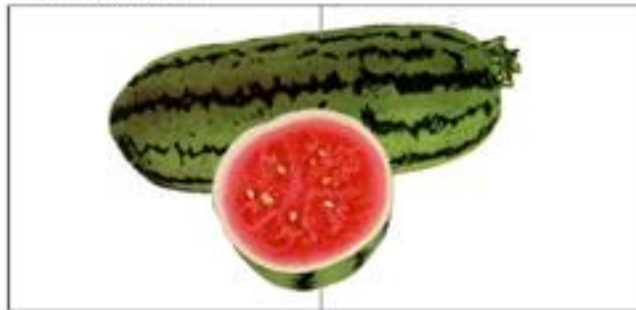
- Keep an eye out for nutrient deficiencies as this method will utilize fertilizer fast; plan ahead and use companion planting for minimizing pests and diseases



EXTRA LARGE

1 PLANT PER 2 SQ. FEET

WATERMELON



SQUASH (SUMMER, WINTER, ZUCCHINI)



PUMPKIN



+
MELON

LARGE

1 PLANT

TOMATO



EGGPLANT



PEPPER



+
CABBAGE BROCCOLI
CAULIFLOWER
OKRA CUCUMBER

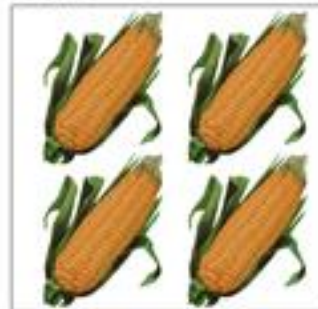
MEDIUM

4 PLANTS

LETTUCE



CORN



STRAWBERRIES



+
PARLSEY BASIL
POTATO MARIGOLD
TURNIP

SMALL

9 PLANTS

BUSH BEANS



BEETS



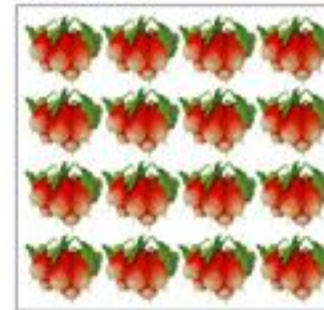
SPINACH



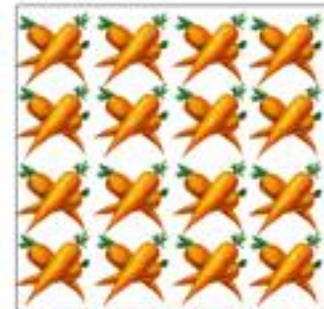
EXTRA SMALL

16 PLANTS

RADISHES



CARROTS



ONIONS



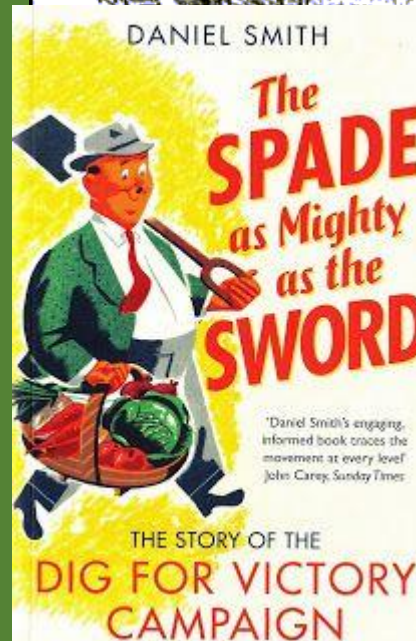
Victory Gardens

- A response to rationing and shortages during World War's 1 and 2, in the early 1950's, along with other times in history where agriculture production and transportation is interrupted

- Victory Gardens require intensive growing and maximum food production grown anywhere there is soil; the law in Britain was all gardens must be minimum 70% food – few ornamental flowers and non-food producing plants allowed

- Growing ornamental flowers in a garden plot during wartime was illegal in WWII Britain – it carried a hefty fine and a possible prison sentence; such plants were transplanted to forested areas

- Small livestock was encouraged with the introduction of rabbits followed by zoning laws revoked to allow chickens and dairy goats; pig clubs were also popular - a group would purchase and raise a single pig by each participant donating funds and kitchen scraps; the pig was harvested under the watch of a police officer and Department of Food official who took half the carcass for government use



A surrealist illustration of a dining table. The table is a simple wooden rectangle with two legs. Instead of the other two legs, a large silver fork and a large silver knife are planted into the floor, supporting the table. On the table, there is a plate of food (possibly a salad or a small pizza), a white cup, and a brown wallet. The floor is a dark brown color with a pattern of small, stylized green plants. The background is a light blue gradient.

supply your own cookhouse

● **MAKE A COMPOST HEAP THIS WAY**



WHAT YOU CAN'T USE

YOUR GARDEN FEEDS YOU—YOU MUST FEED YOUR GARDEN

On Allotments & Private Gardens

Enquire :-
Parks Superintendent,
Bolton. Phone 383.



**SCUSE THE DIG, BUT—
WHAT ABOUT YOUR LAWN?**



*Raised 'em myself
in my*
U.S. School Garden

KEEP IT DRY, FREE
FROM GLASS, METAL,
ROBOTS, PULPITS ETC.

**IT ALSO FEELS
POULTRY** — Many
Cassidy's are raised

DIG WELL Little and often is the rule

GROW FOR WINTER Plan your cropping

KEEP YOUR LAND FERTILE If you can't find time to compost

TACKLE PESTS AND DISEASES EARLY It'll save you trouble

KEEP YOUR TOOLS CLEAN It makes work easier

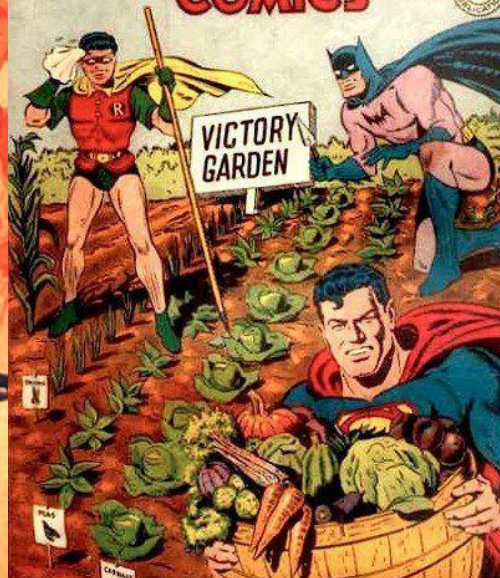
GET THE BEST ADVICE Your dog could dig for you! Dig for worms, slugs, snails, beetles, and other creatures that can help you.

For their sake -
**GROW YOUR OWN
VEGETABLES**

FALL ISSUE

150

WORLD'S FINEST COMICS



Vertical Gardens

- Vertical garden varieties are vast; only limited by your creativity
- Placement is an issue with access to light; Growing near a wall, even with partial light on the plant, might not be enough for full sun plants
- Like all container gardens drainage is an issue; most folks forget to place holes at the bottom of containers – results in swamping the plant and drowning it (yes, plants can drown)
- Use UV-resistant plastics if the vertical garden is to last more than one year; we tried the milk jug idea - sunlight eventually broke it down chemically and the jugs crumbled



Community Gardens

- For large groups who have no private yards, such as apartment renters and condo owners, or for families looking to expand their productive reach
- Utah State law now has generous provisions for communities looking to start; this cannot be done on Church property – something about zoning and taxes, but there are vacant lots and public parks around our Ward area the owners and city might be open to renting
- Some local lots do not have water access so bringing in water tanks by car is needed
- Some community garden agreements have either everyone work a certain amount of time on a single multi-acre garden for a share of the produce, or allows a subdivided small plot rental



Indoor Gardens

- This is a different method that using a greenhouse or cold frame as it utilizes an enclosed room / shed
- All outdoor crops and a variety of tropical plants such as citrus and myrrh do well indoors with the right conditions - very useful for growing foods in the wintertime
- A commercial system with red to blue spectrum lights can be very expensive; for artificial lighting on a budget: install Metal Halide bulbs with appropriate ballast for 110v, newer types of LED strips chained and clustered together
- Plants need resistance to encourage strength in trunks and stalks; provide a light breeze with floor fans to circulate air and give the plants the stimulus to grow thick trunks and limbs; a heater is also needed
- Provide plenty of space for expansion and water regularly



Hydroponics

- Hydroponics is a subset of hydroculture; a method of growing plants using mineral nutrient solutions, in water, without soil
- Hydroponics increases crop yields exponentially: tomato farmers claim an increase of 18X their previous crops, lettuce farms an increase between 7 – 12X depending on variety used (lettuce that took 90+ days to mature in soil now takes 24 - 45 days)
- Can be done at home (inside or outside), but initial costs are higher compared to soil methods; long-term production offsets initial costs within 2 years
- Requires more detailed attention than a soil garden to avoid fungus infections, airborne pests, and nutrient concentrate problems; but requires a lot less physical labor
- Will provide more information later in this presentation



Aquaponics

- Aquaponics combines aquaculture (fish farming) and hydroponics
- Creates a self-feeding cycle: the fish secrete ammonia and fecal matter, a pump sends both upwards to a bed of plants where bacteria digest the ammonia into nitrates with the manure into potassium and phosphates, which is then absorbed by the plants; the clean water drips back into the fish tank
- Adding rabbit or chicken manure to the fish tank fertilizes the water and encourages algae growth which vegetarian fish eat – fish and plants thrive better with this addition
- Provides greater varieties of foods in a smaller area than hydroponics (both meat and vegetation), and unlike hydroponics does not require annual washouts as nutrients are regulated by the fish and plants more efficiently
- Fish are regulated by Utah Ag or Salt Lake County like other small livestock – possessing a lot more than 4 is legal
- Shall provide more information later in this presentation



CNC “Farmbot” Set-up

- Farmbots are raised beds with an attached CNC rotary arm that acts as a tiller, weeder, and irrigation spout; the system is made from uv-rated, outdoor plastics
- Very expensive; however, will care for your garden on it's own with occasional app checkups; requires programming skills in G-language and CAD/CAM
- The model shown here is planned out on a phone app; you place seeds in the correct containers on the side and the robot plants and waters each seed as directed; the areas where plants are present that weren't designated by you are treated as weeds – a special tool is used to push down and chop the weed into mulch
- Requires water / power hookups, and Wi-Fi access



CNC Programming Basics

Program structure

Every program consists of:

- Program Start
The program start is the program number. The program number begins with character/letter **O**.
- Program Contents
NC blocks
- Program End
M30 for a main program
M17 for a sub-program

Soil Management

•Clay soil is abundant in West Valley and easy to improve

•Adding sand, compost, peat moss, vermiculite, and other soil conditioners will help with drainage and root anchoring; adding sand to clay will not turn the soil to “concrete” as concrete requires high amounts of slaked lime

•Our soil is affected by buried trash from decades ago plus run off from the Oquirrh mineral deposits; we have higher concentrations of iron, copper, and other trace minerals

•Adding 3-5 inches of topsoil does improve clay loam; be sure to lime and condition after application



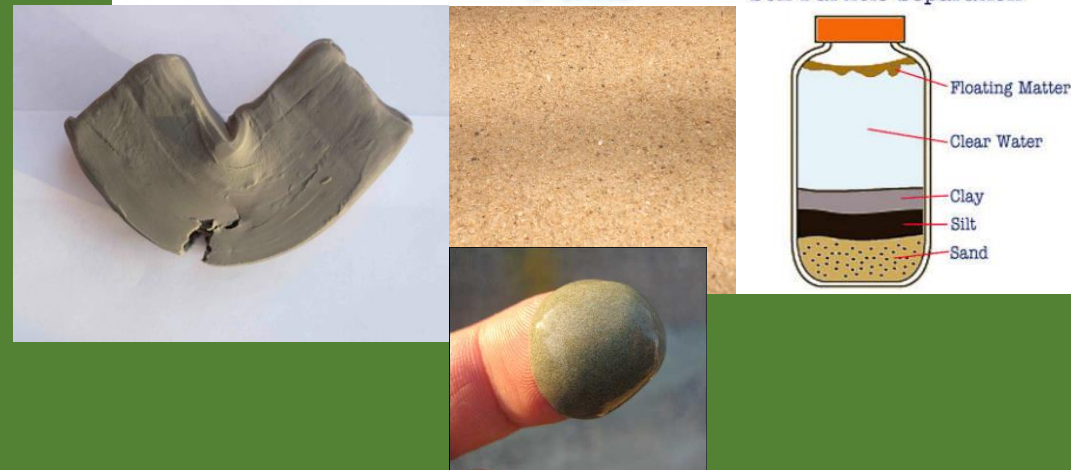
Soil Composition and Additives

- Soil is a balance of sand/clay/silt with organic material mixed in

- The idea of soil additives is to move the soil's spectrum from Clay to as close to loam as possible; loam being the best growing medium

- Adding sand directly to clay soil will help, but no one sells garden silt (majority quartzite); we use perlite or vermiculite to mimic silt's effects

- Soil conditioners use a combination of fine organic material (such as bark and compost) mixed with peat moss to break up clay soil; these work well but are temporary

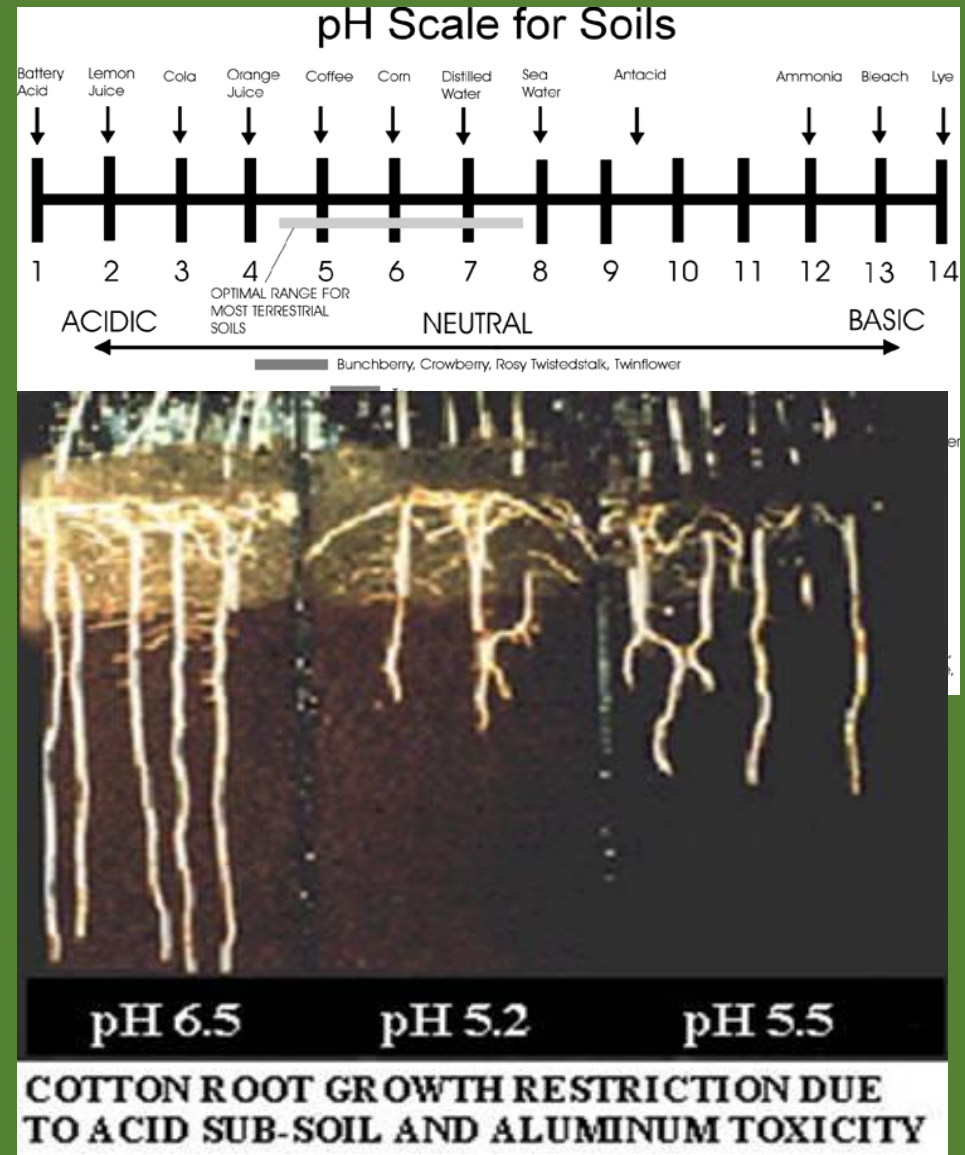


Soil pH and Liming

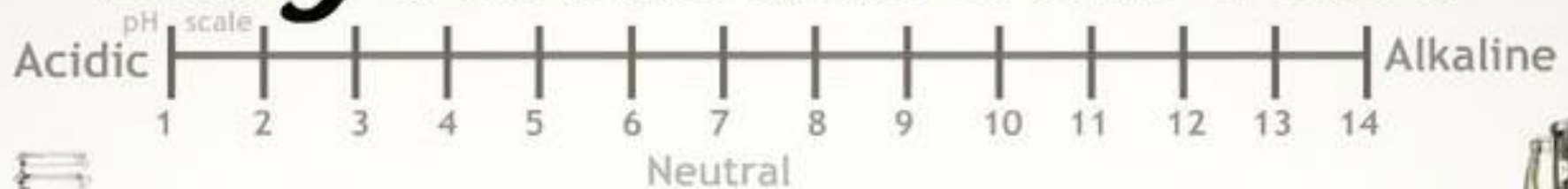
• Acidic soil occurs naturally – created by chemical forces of soil decomposition (when pebbles decompose into sand, the chemicals in the rock are exposed and grab onto the soil's nutrients); animal urine and some plants, like evergreens, add concentrated acid to the soil as well

• Adding hydrated lime to acidic soil chemically releases the nutrients; To make hydrated lime, heat limestone in a kiln to 2000° F (be very careful as slaked lime is toxic and dangerous to touch and inhale), lightly crush the slaked lime to avoid dust and add water until the lime won't absorb it – it's now safe to touch and use in the garden

• Chances are good that no pH testing is needed for West Valley soils, assume high acidity and add lime; alkali (base) soil in our area is rare and would be caused by industrial waste instead of natural soil deposits



Easy At Home Soil Test



Vinegar

+



Soil



Soil

+



**BAKING
SODA**

+



Water

1. Venture into your garden with two clean glass jars. Place a handful of soil into each.

2. Next, add one half cup water and one half cup baking soda to the first jar,

3. and one half cup vinegar to the second.

If this bubbles,
your soil's pH is
ALKALINE

Add sulphur
or pine needles
to boost acidity

If this bubbles,
your soil's pH is
ACIDIC

Amend soil with
lime or wood ash
to raise the pH



Saline (Salty) Soils

.Utah is notorious for high soil salinity (salted soils); West Valley soil isn't high in salt content as our soil is former commercial and small family farmland, but there is some

.To remove saline from soil: prepare a large container with a small spigot installed at the base and two large poles – should slightly resemble a wheelbarrow, place a screen inside the container to prevent soil from leaving through the nozzle; shovel soil into the container followed by stock pots of hot water; stir the soil to ensure full saturation; drain out the salty water into a separate container and move away from the garden, dump out the desalinated soil

.To refine the salt: pass the saline water through a series of coffee filters until clarified; pour into shallow containers and leave in the hot sun to evaporate and crystalize; grind to powder

.The salt is just straight salt and has no added iodine – take a supplement if consuming



Soil Erosion

- Erosion is topsoil depletion by either water or wind
- Water erosion is usually caused by a lack of vegetation on slopes, while wind erosion is from a lack of vegetation the year round
- If your garden is on a slope, build horizontal terraces on contours greater than 8 degrees
- Rest a section of your garden to allow nutrient replenishment and avoid erosion if a garden is to rest, it's best to plant a green mulch of winter rye, grass, etc. that will be tilled in the following year – do not allow it to go to seed or grow over 1 year
- The dust bowl of 1935-1940 is the costliest man-made disaster in US history: 30,000 killed; 2.5 million displaced; damage in \$ is still unknown



Garden Construction and Planting

.With plans in place, use stakes and twine to map out your garden plot; two people can construct a large garden in a matter of hours; for optimum results build your garden in the autumn and allow to overwinter; if the garden is needed sooner then spring preparations will do, but results may be poor

.For beginners, purchase or borrow a set of basic hand tools and work a small plot to earn your green thumb

.There will be years of bumper crops and years of failed crops – this is normal, but always do your best

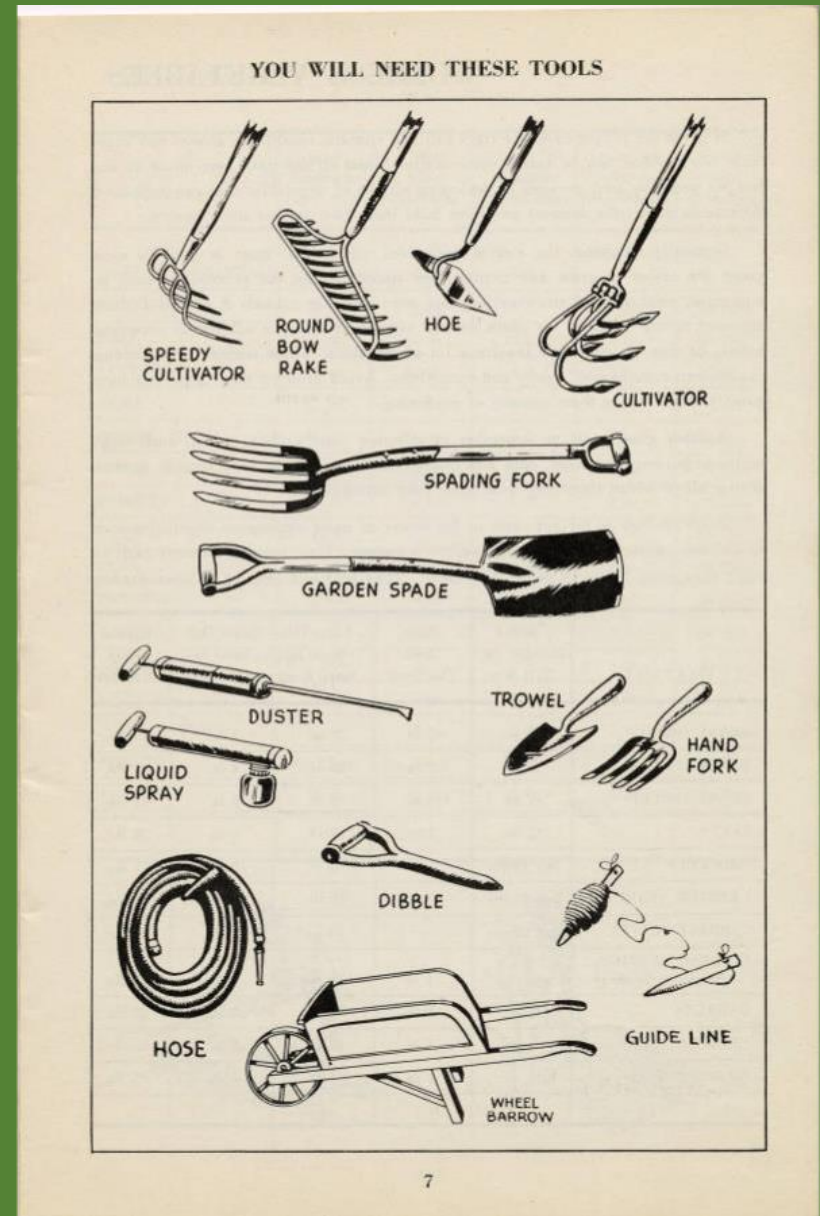


Hand Tools

- Hand tools are the least expensive and easiest to use – but can be time consuming with a larger garden

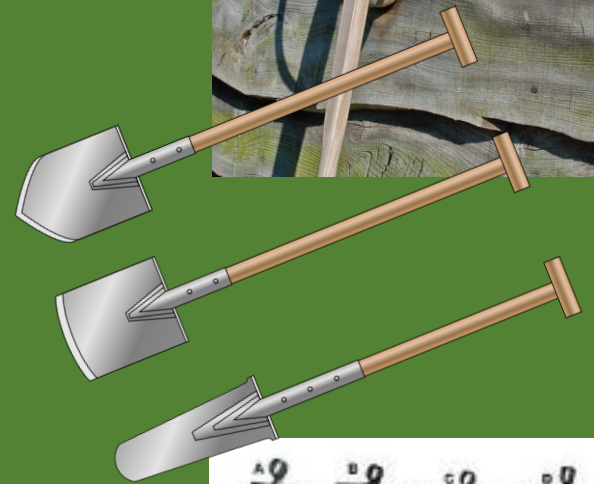
- Simple tools such as a spade, garden fork, hoe, rake, trowels – but the best tools a gardener has is their own two hands

- Good quality hand tools can be bought at Deseret Industries or made at home



Building Garden Tools (Easy Method)

- Rakes: Find a three-foot length of 2x2 and center drill 1/8" holes every 1/2" inch – leave at least 1" unused on both ends; center drill a single 5/8" hole on the side of the 2x2 for the handle; buy a handle from a hardware store or use a 3/4" dowel with one end tapered to 5/8"; place a few drops of glue or epoxy into the 1/8" holes followed by a 4" framing nail; attach wires to both ends of the 2x2 and wrap around the handle about a foot above to stabilize
- Shovels: Using 14 ga steel plate, cut in the desired shovel shape with a wide T-shape at the end; clamp down a piece of 5/8" black gas pipe and beat shape the shovel's T end around the pipe; shape a ridge from the handle to the shovel plate center so the plate is angled upward; shape the plate sides next to the handle in a 90° angle for a foothold; using a soldering torch, temper the metal as mentioned above
- Hoes: Using 16 ga steel plate, cut in the desired hoe shape with a wide T-shape at the end; clamp down a piece of 5/8" black gas pipe and beat shape the hoe's T end around the pipe; bend the hoe plate to a 90° angle and spot weld the plate and handle for strengthening; using a soldering torch, temper the metal as mentioned above
- Garden Forks: Using 3/8" steel bars or rebar, cut 2 long pieces to desired length – one shorter than the other; bend both to 90 deg angles as shown on the right and weld the pieces together in the middle; make a shovel T end and weld on the tongs; heat treat with care as the ends of the fork can overheat quickly



Powered Tools and Tractors

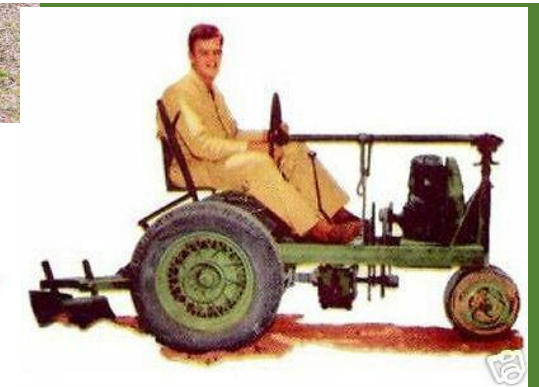
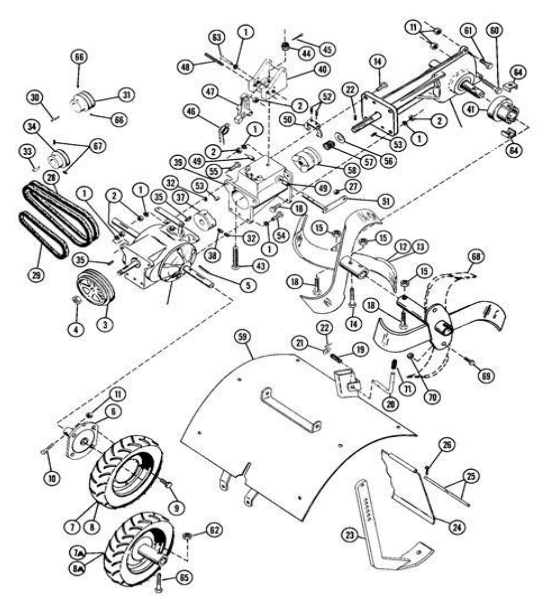
•When gardens expand, hand tools may not be enough to keep up with the workload, or may take up far too much time

•Observe all safety precautions and wear all appropriate personal protective equipment; better a little caution than a great regret

•Tractors use a combination of heavy torque and downward force from the large back wheels to create exceptional pull and push capabilities

•Most powered garden tools can be purchased for a good price at Deseret Industries, or can be built at home – including tractors, rototillers, and aerators

•www.vintageprojects.com has free yard and tractor plans



Autonomous Robotics

- The new direction in agriculture
- Currently only Farm-bots, quad-copter drones for surveillance and crop dusting, and grass mowers are on the residential commercial market; autonomous dairy feeders, manure handlers, and milkers are also available
- New models of seed drills, weeders, and harvesting machines are beginning to emerge
- Can be expensive; a quad-copter drone for crop dusting can run above \$4000 USD; with a lot of study and skill, any of these robots can be homemade
- Remember to add required sensors and programming to any autonomous machine; they can be very dangerous if not programmed specifically
- Robots are best utilized in hydroponic systems



Soil Steaming

• Even the best laid plans can still result in pathogens and pest infestations – ruining your garden each year

• Steam sanitizing your soil is a massive undertaking; but with careful attention afterward to weeding, crop rotation, and possible uses of pesticides, a garden can be productive again

• Some professionals recommend steaming soil for any new garden plot – usually it's the only time steaming is necessary if done early



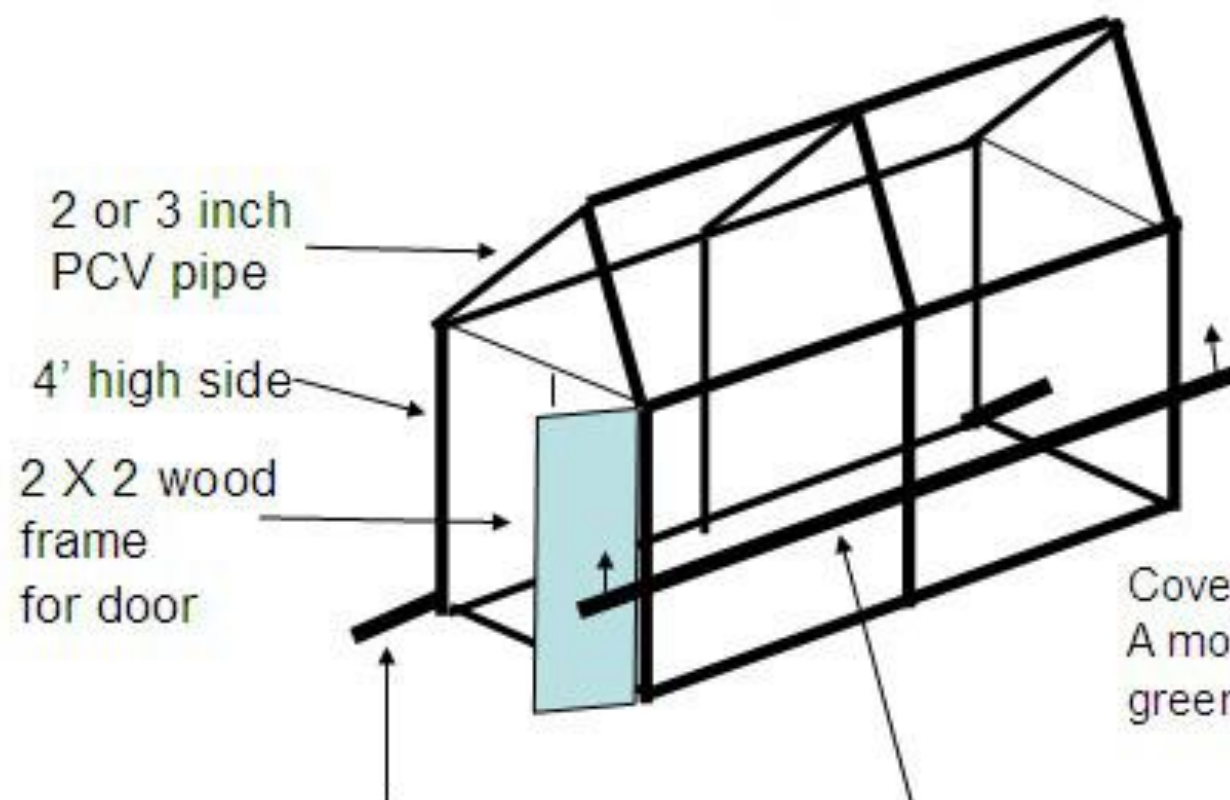
Greenhouse

- A greenhouse is a heated enclosure used to grow plants year round
- Excellent for seedlings, transplants, citrus or any plants that do not grow in our climate
- Can be made of cheap materials such as PVC pipes, lumber, and UV-resistant plastic lined with bubble wrap
- Heating costs can be expensive; one way to reduce heating costs for a small greenhouse is to channel an electric clothes dryer machine's exhaust through an insulated pipe into the greenhouse
- Zoning restrictions: a small 2' x 4' temporary structure made of PVC for overwintering or sprouting seedlings is fine, and larger structures could be passable so long as it comes down; a permanent greenhouse may require filing a zoning permit



Easy 20' by 10' Green House Using 2" PCV pipe and 2X2's

To get consistent crop of tomatoes in the Seattle area you need a small green house. Put a water bed Heater in floor for Heating and florescent Grow light for extended sun hours in early spring.



You can do the same thing
With two 20' lengths of 1"
PCV pipe

Cover with plastic each year. Or for
A more permanent structure cover with
green house plastic roofing sheets

Put two PCV pipe lengths on each side of green house. Then
you can roll the plastic up when it gets too hot. In hot summer
you can roll the plastic all the way to the top of the roof on
both sides.

Cold Frame and Hot Bed

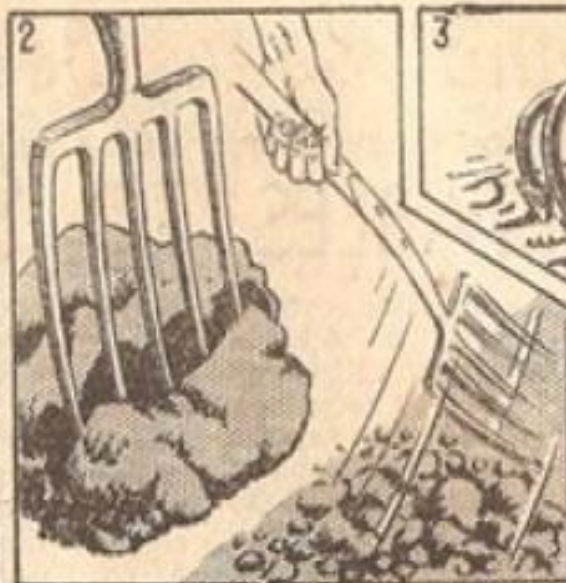
- A cold frame is a greenhouse with no heater; good for starting seedlings early by protecting them from frost
- A hot bed is a cold frame with a foot or more of non-composted manure under a 5 inch layer of topsoil; the decaying material and sunlight heats the bed
- A set of old windows or clear plastic, and some lumber to frame; attach to raised beds for an extended growing season
- Beware of rodents and varmints making homes in these – especially in the wintertime; set bait or traps inside; we have a mid-March yearly snowfall, so if starting seedlings early clear off all snow and check seals to prevent frost



Cloches and Tunnels

- Many homes might not have the space for a greenhouse or cold frame
- Cloches (single covering for a plant) and tunnels provide the same protection as cold frames; are used to extend growing seasons
- Most cloches are inexpensive to make out of waste materials – milk jugs, bottles, etc; be sure there's no holes for heat and water to escape; tunnels are made with thick wires or plastic hoops holding sheeting 1 foot minimum above and around the plant
- Weeds will fight tooth and nail to grow inside and choke out any competition – weed more often than usual and add suppressants



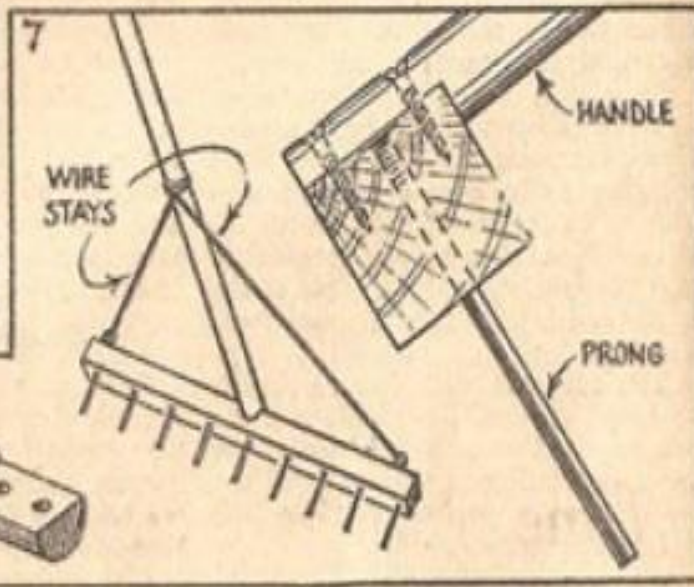
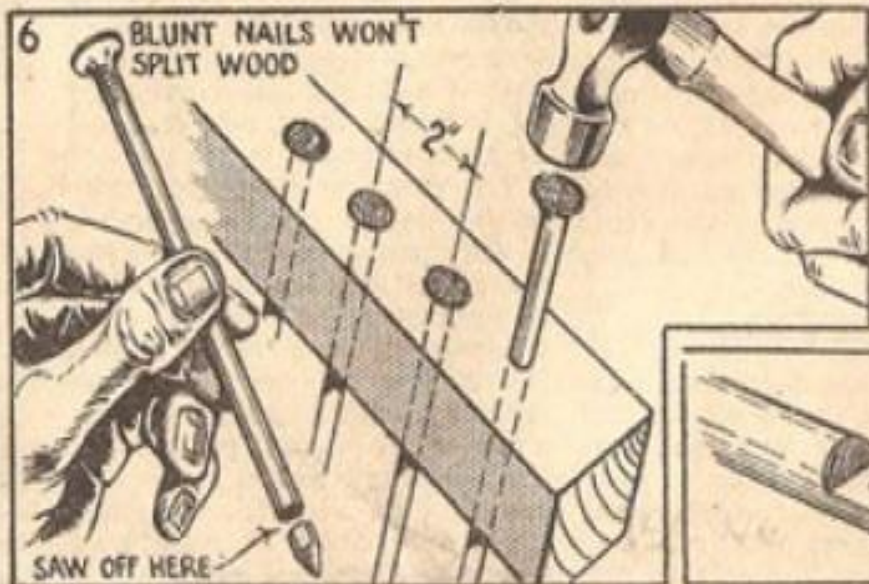


An important step in
growing good crops—

MAKING A SEEDBED

Explained for you in pictures

THE first step in preparing a seedbed is to break down the lumps left from the winter digging. The soil needs to be in the right condition for this—not too wet, not too dry. You cannot make a seedbed if the soil sticks to your feet (1). This breaking up may be done with the digging fork (2) but on medium and lighter soils the pronged cultivator (3) is often preferred. After being given a few hours to dry the soil may be firmed, either by shuffling with the feet or using home-made firming boards (4) which avoid the irregular and undue compression that the heels of boots can sometimes produce. Now rake first one way then the other, with a wooden hay rake (5) to remove stones and stubborn clods. If you have no wooden rake you can easily make a substitute (6 and 7). Finally, the surface is reduced to a fine tilth with the iron rake, the surface being left quite level.



Stones in the Soil

- Most gardens will develop issues with stones; during winter the frost and ice tends to open soil and push rocks from the bedrock subsurface upwards; these stones interfere with plants and make growth difficult
- Build and utilize a rock screen out of wood and hardware cloth to remove unwanted stones, debris, and trash; pictured right is a motorized version; a simple wood frame with hardware cloth works well
- keep for later use in landscaping or construction



Fertilizing

•After preparing the seed bed, add fertilizer to the top; the nutrients will leech into the soil from the top down; add most in early spring, less nearer to end of the growing season

•The three main fertilizing agents are what's called the NPK balance: nitrate (N), phosphate (P), and potassium (K); nitrate is used in leaf growth and health; phosphorus is essential for the plant's metabolism; potassium strengthens cell growth and development – essential for fruiting bodies and seeds

•Fertilizer comes in chemical forms (15-15-15, 24-0-0, etc.; numbers follow NPK order), manure (well balanced by nature), compost (nutrients are variable but can be balanced by close attention on what's added), and fireplace ashes (good source of potassium)

•In fall, turn over the finished bed with some more fertilizer getting mixed in



Fertilizer Facts

- Fertilizer is not plant food: it's the multivitamins that plants use to produce the foods we eat; plant food is glucose that's created in the leaves
- Lack of fertilizers has historically led to long-term famines, dust bowls, and the end of city-states and empires
- In 1945, an internal memo of the British Government stated that food production had stalled due to intensive cropping and lack of all kinds of fertilizers. If VE-Day did not come that year, Britain would've faced a full-blown famine and surrendered

Manure, Compost, and Soil Conditioners

- Apply manure or compost at least 2 inches deep every 1-3 weeks for best results
- Soil conditioners are a mix of compost, peat moss, and chemical fertilizers with the high-end brands mixing in hydrated lime and pre-emergent herbicides; either till into the soil then again topically for a new garden, or 1-2 inches thick on top at the start of the season; can get expensive to purchase commercially
- Adding vermiculite, perlite, hydrated lime (for high acid soil), gypsum, acidifier (for high alkaline soils – not common in West Valley) helps with moisture retention and pH; vermiculite is much cheaper than perlite, but perlite will remain in the soil longer
- **DO NOT USE HOMEMADE HUMANURE**



Standard Fertilizer Mix



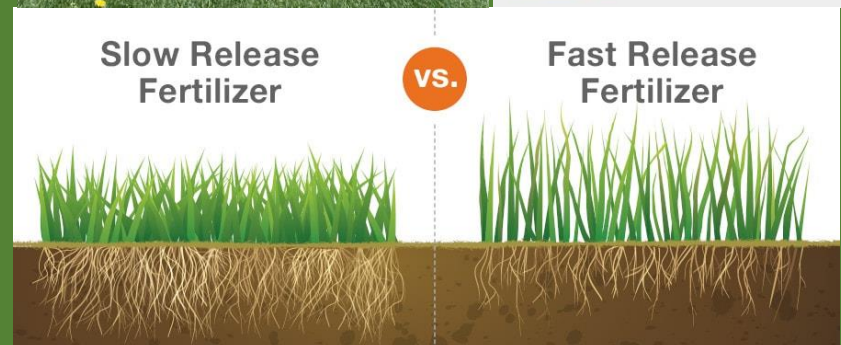
Liquid Fertilizer

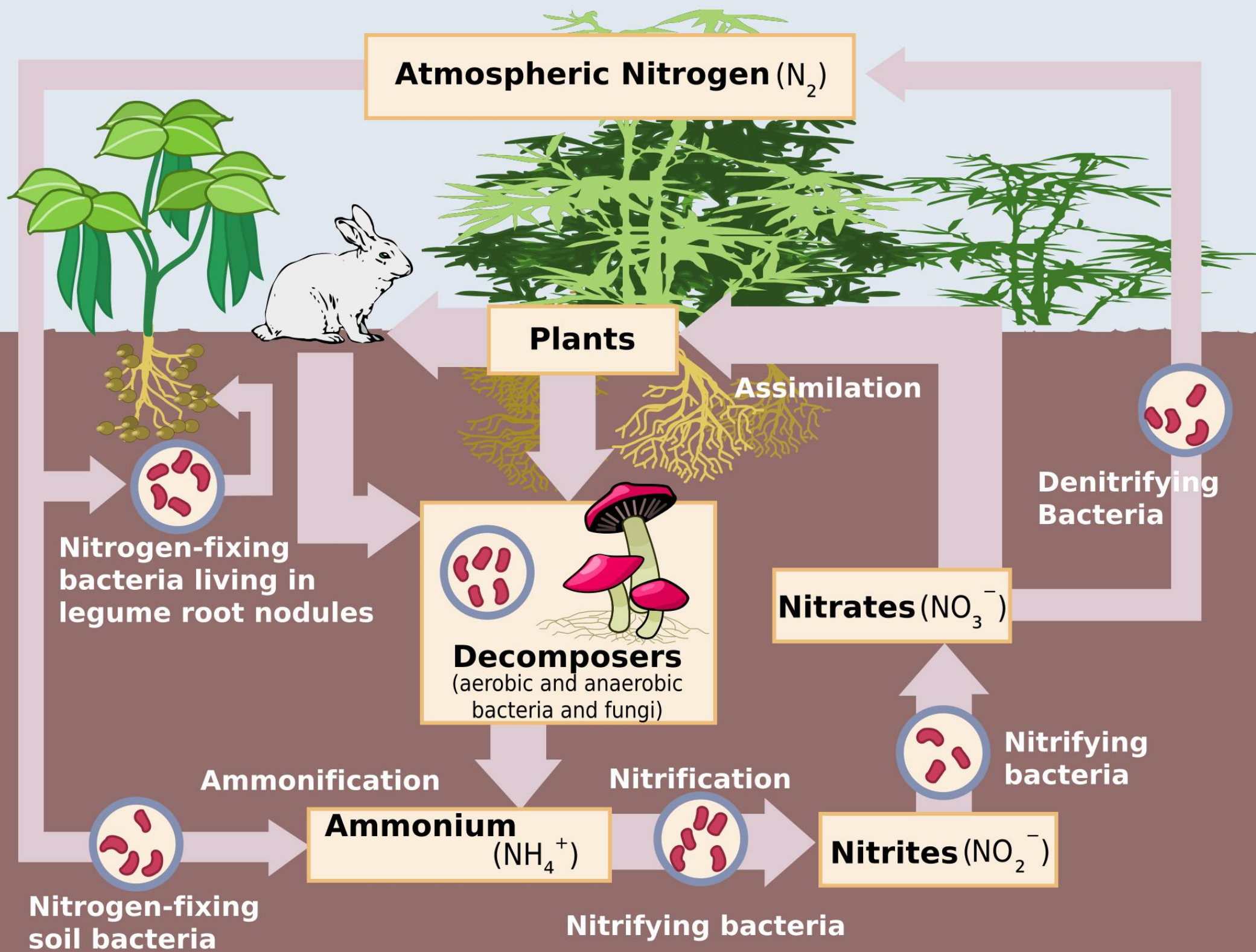
- Generally more expensive than dry slow release fertilizers – best used as a fast acting garden saver
- Can be mixed into irrigation water regularly as a routine fertilizer; apply this type every two-weeks
- The plants absorb the soluble nutrients immediately and results are visible within hours, which is a positive during our dry seasons
- Measurement tolerance of this fertilizer type is much more narrow than slow release
- Manure can be leached with hot water to make an organic, homemade liquid fertilizer; use as soon as the water cools; or filtered, concentrated, and crystalized for later use



Granular and Control Release Fertilizer

- Best utilized when planned ahead
- The most common NPK ratio is 15-15-15 – comes in pearl-like granules, used for most garden applications; reapply monthly
- Lawn fertilizer is usually of this type and part of a treatment system; best to pick one and stick with it throughout the year
- Granular for grains (wheat, barley, and such) is usually done with one application of 15-15-15 then followed up with a few 21-0-0 until harvest; the rest of garden does well with just 15-15-15; apply granular every 6-8 weeks, control release usually lasts the whole growing season
- Broadcasting by hand is alright, but a spreading device gives uniform results; spreaders also works with small seeds and ice melt, too





Deficiency Guide

Even when you use a high quality, consistent nutrient you could still run into deficiency problems. In this case, the deficiency is often caused by other factors than the nutrient (read more on page 26 of this CANNAtalk). This deficiency guide helps you to first recognize the deficiency (what can you see?). And then it advises you what you can do in case you use a lower quality nutrient

brand that might have been the cause of the deficiency. Followed by what you can do in case you use a high quality nutrient brand (such as CANNA) and the deficiency is caused by something else. We have produced this guide in collaboration with CANNA Research. We hope it is a useful tool to hang on your wall so you can check it easily although we hope you won't need it often.

Calcium



What can you see?

Yellow/brown spots, surrounded by a sharp brown outlined edge.

What can you do when you use a lower quality nutrient?
Add calcium by applying a liquid lime fertilizer such as a calcium nitrate solution.

What can you do when you use a high quality nutrient such as CANNA?

- Verify how you water (check feed-to-know video 1, season 2 on CANNIA website)
- Verify EC of the root medium
- Check if you used too much potassium additive (like CANNIA PE13/14)
- Check if your medium temperature is too low (lower than 64°F)

Phosphorus



What can you see?

Small plant with purple/black necrotic leaf parts. Leaves become malformed and shriveled.

What can you do when you use a lower quality nutrient?
Mix inorganic phosphate fertilizer thoroughly through the potting mix or add extra liquid phosphate when growing in hydroponics.

What can you do when you use a high quality nutrient such as CANNA?

- Check if your medium temperature is too low (lower than 64°F)
- Check if your root medium EC is too low

Magnesium



What can you see?

Rusty brown spots, cloudy, vague yellow spots between the veins.

What can you do when you use a lower quality nutrient?
Spray with a 2% solution of Epsom salts every 4-5 days during about a week.

What can you do when you use a high quality nutrient such as CANNA?

- Verify how you water (feed-to-know video 1, season 2 on CANNIA website)
- Verify EC of root medium
- Check if you used too much potassium additive (like CANNIA PE13/14)
- Check if your medium temperature is too low (lower than 64°F)

Iron



What can you see?

Strong yellowing of especially the young leaves and growth shoots between the veins.

What can you do when you use a lower quality nutrient?
The best thing is to spray the plants with a chelated source of iron.

What can you do when you use a high quality nutrient such as CANNA?

- Verify how you water (check feed-to-know video 1, season 2 on CANNIA website)
- Verify EC of root medium

Nitrogen



What can you see?

Purple stalks, yellowing leaves and leaves fall off.

What can you do when you use a lower quality nutrient?
Raise EC of the feeding or add extra nitrogen.

What can you do when you use a high quality nutrient such as CANNA?

- Verify how you water (check feed-to-know video 1, season 2 on CANNIA website)
- Verify EC of root medium
- Check if your medium temperature is too low (lower than 64°F)

Potassium



What can you see?

Dead edges on the leaves.

What can you do when you use a lower quality nutrient?
In case the EC in the substrate or potting mix is high, you can raise it with clean water. Add potassium yourself.

What can you do when you use a high quality nutrient such as CANNA?

- Verify EC of root medium (probably too low)

Manganese



What can you see?

Yellow stripes appear between the leaf's side veins.

What can you do when you use a lower quality nutrient?
Using products that contain trace elements (Micromix).

What can you do when you use a high quality nutrient such as CANNA?

- Verify how you water (check feed-to-know video 1, season 2 on CANNIA website)
- Verify EC of root medium
- Check if your medium temperature is too low (lower than 64°F)

Herbicides

- Herbicides are the subject of heated debate as to their safety, but so long as instructions are followed and protective equipment used there shouldn't be any issue
- There are several types of herbicides on the market: weed & feed, pre-emergent, total coverage, etc.; the safest for food production gardens is a garden safe pre-emergent (targets and prevents only weed seeds from germinating), used after tilling and before fertilizing and planting – reapply only when the instructions say to
- Herbicides are filtered out by the crops and rinsing with water removes it from the plant's exterior



annual bluegrass (*Poa annua*)
 barnyardgrass (*Echinochloa crus-galli*)
 brome (*Bromus* spp.)
 carelessweed
 carpetweed (*Mollugo verticillata*)
 cheat grass (*Bromus tectorum*)
 chickweed (*Stellaria media*)
 Crabgrass (*Digitaria sanguinalis*)
 fall panicum (*Panicum dichotomiflorum*)
 Florida pusley (*Richardia scabra*)
 goosefoot
 goosegrass (*Eleusine indica*)
 guineagrass (*Urochloa maxima*)
 hare barley (*Hordeum murinum* ssp. *leporinum*)
 henbit (*Lamium amplexicaule*)
 Johnsongrass (*Sorghum halepense*)
 junglerice (*Echinochloa colona*)
 kochia (*Kochia scoparia*)
 lambsquarters (*Chenopodium album*)
 lovegrass (*Eragrostis curvula*)
 prostrate knotweed (*Polygonum aviculare*)
 puncturevine (*Tribulus terrestris*)
 purslane (*Portulaca oleracea*)
 rattail fescue (*Vulpia myuros*)
 Russian thistle (*Salsola iberica*)
 sandbur (*Cenchrus* spp.)
 signalgrass (*Brachiaria* spp.)
 southwestern cupgrass (*Eriochloa acuminata*)
 sprangletop (*Leptochloa* spp.)
 stinging nettle (*Urtica dioica*)

When to Plant

- Traditionally, the last frost date for zone 7a is after Mother's Day, however the USU Ag Extension changed Salt Lake County's last frost to April 30th
- The follow planting dates comes from the same USU Extension:
 - Group A: plant around March 15th
 - Group B: plant around March 20th
 - Group C: plant around April 30th
 - Group D: plant around May 15th
 - Group E: follow the dates listed on the chart
- Transplant trees and shrubs with Group C, around April 30th
- Planting seeds and transplants in cold frames and cloches extends growing and harvesting times

Group A: Hardy

(Plant as soon as the soil dries out in the spring.)

Seed:

Kohlrabi	Onions	Peas
Radish	Spinach	Turnip

Plants:

Artichoke	Asparagus	Broccoli
Cabbage	Turnip	Brussels Sprouts

Group B: Semi-Hardy

(Plant a week or two after "A" group or about 2 weeks before average last spring frost.)

Seed:

Beet	Carrot	Endive
Lettuce	Parsley	Parsnip
Potato	Salsify	Swiss Chard

Plants:

Cauliflower

Group C: Tender

(Plant on the average date of the last spring frost—about when first apples reach full bloom.)

Seed:

Cucumber	Dry Bean
New Zealand Spinach	Snap Bean
Spinach	Summer Squash
Sweet Corn	

Plant:

Celery

Group D: Very Tender

(Plant when the soil is warm, about 2 weeks after "C" group.)

Seed:

Cantaloupe	Lima Bean	Winter Squash
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Plant:

Eggplant	Pepper	Pumpkin
Tomato	Watermelon	

Group E: Special Plants for Fall Harvest

Average Planting Time

Beets	July 1-August 1
Cabbage	May 1-July 15
Kale	July 1-August 15
Lettuce	June 1-August 1
Onion	August 1-August 10
Rutabaga	June 15-July 1
Spinach	July 1-August 15
Turnip	July 1-August 1

Seed Planting

- The apex of all your hard work up to now; planting seeds
- Follow the instructions on the seed packet for optimum results; some plants work better seeded into mounds, others into trenches
- Use a seed drill with the appropriate plate installed for large areas; the machine opens a space, inserts a seed, and covers it up in one motion
- Use a planting rake for medium sized areas; these create indentations in the soil perfectly spaced for your seeds – not adjustable, but easy to make at home
- Plant your seeds 3X the size of the seed, cover with soil, and water immediately and daily for fastest germination

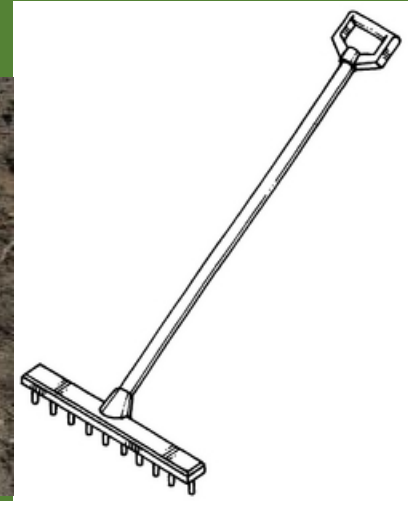


Seed Drills

- Planting seed by hand is time consuming for a larger plot

- Mechanical seed drills are mainly used for planting a bumper of one or two crops (like wheat, corn, or beans); if planting a variety of seeds in your garden, it's best done by hand

- Simple hand planters and drill poles (creates perfect spacing and holes for seeds) to mechanical drills save time and effort; a simple hand planter is just a $\frac{1}{4}$ " PVC pipe with the seed dropped into pre-drilled soil



Seed Planting & Spacing Cheat Sheet

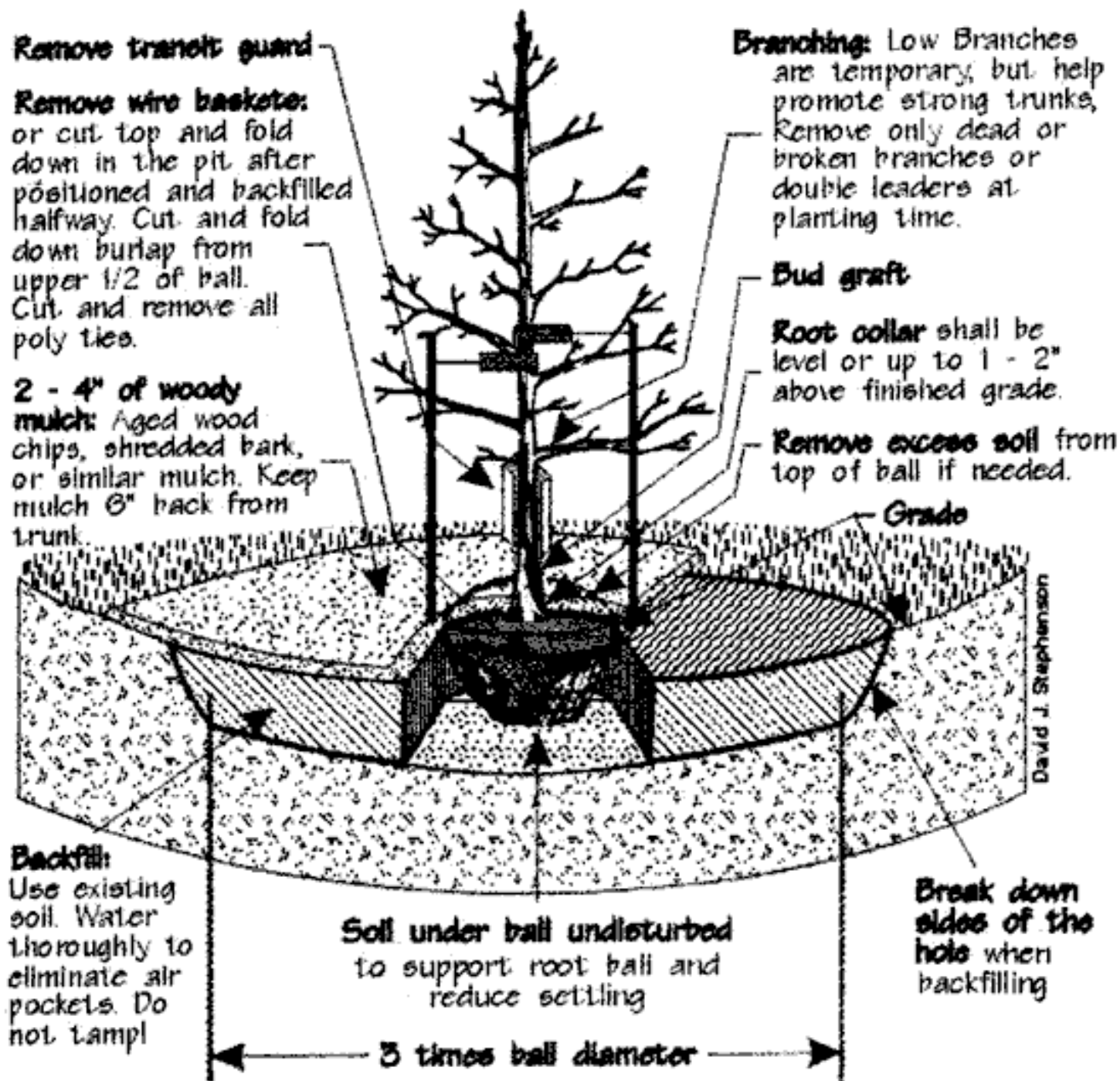
Vegetable	Spacing Between Plants (inches)	Spacing Between Rows (inches)	Depth to Plant Seed (inches)
Artichokes	36-48	48-60	1
Beans (Bush)	2-3	18-24	1
Beans (Pole)	4-6	30-36	1
Beets	2-3	12-18	1
Broccoli	3	24-36	1/2
Brussels Sprouts	24	24-36	1/2
Cabbage	18-24	24-36	1/2
Carrot	2-4	12-24	1/4
Cauliflower	18-24	24-36	1/2
Celery	8-10	24-30	1/4
Chard	9-12	18-24	1
Chicory	12-18	24-36	1
Chinese Cabbage	8-12	18-30	1/2
Collards	12	18-24	1/2
Cucumber	12	18-72	1/2
Eggplant	18-24	24-36	1/4
Kale	8-12	18-24	1/2
Kohlrabi	5-6	18-24	1/4
Leek	6-9	12-18	1/8
Lettuce	6-12	12-18	1/8
Mustard	6-12	12-24	1/2
Onion	1-2	12-18	1/4
Parsnip	2-4	18-24	1/2
Pea, Shelling	1-2	18-24	2
Pepper	18-24	24-36	1/2
Pumpkin	24-48	60-120	1
Radish	1-6	12-18	1/2
Rhubarb	30-36	36-48	1/2
Rutabaga	6-8	18-24	1/2
Spinach	2-4	12-24	1/2
Squash, Summer	24-46	18-48	1
Squash, Winter	24-48	60-120	1
Tomato	18-36	24-48	1/2
Turnip	2-4	12-24	1/2
Watermelon	24-72	60-120	1

Transplanting

- Grow seedlings early in the year and use them for transplanting; especially good method for growing warm climate crops in colder areas
- Transplant seedlings into pots; most annuals are transplantable after a month, perennials and tender plants might need an extra month
- Transplant potted plants into larger pots 1 inch deeper and 1 inch wider than the previous container
- Growing indoors under lights is difficult: must use metal halide grow lights or direct sunlight - using shop fluorescents, LED's, and aquarium bulb starves plants so they make long, weak sprouts to reach closer and entwine themselves around the bulbs; these plants need adaptation to the outdoors – move outside for half a day for a few days, then the whole day for a few days, then they can be left outside; easier to grow seedlings outside in a protected structure



Proper Tree Planting Diagram



Companion Planting

•Plants are susceptible to certain pests and diseases

•Companion planting pairs different plants together that repels each others pests and diseases; reducing the need for traps and pesticides – a good example being rhubarb and cabbage in preventing cabbage club foot disease

•Some plants assist in fertilizing other plants, such as pairing green beans with salad greens where beans add nitrogen to the soil

Companion Planting OneCreativeMommy.com

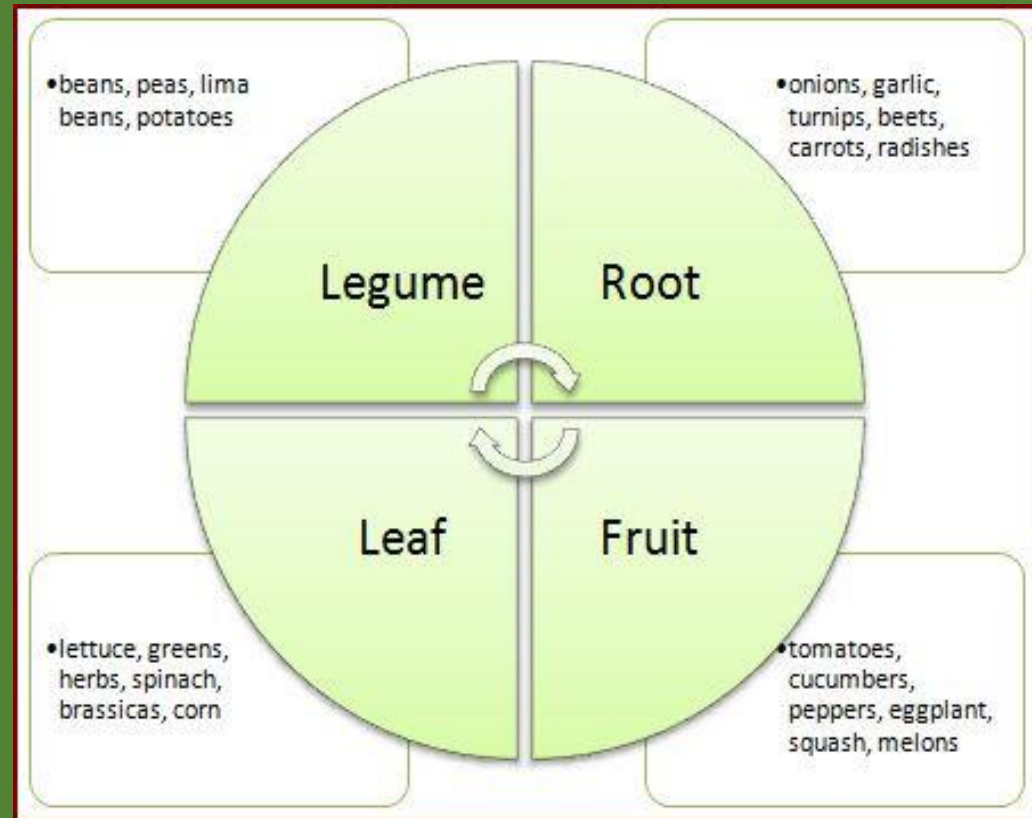
	Basil	Beans	Broccoli	Carrots	Cauliflower	Chives	Cilantro	Corn	Cucumbers	Dill	Garlic	Leeks	Lettuce	Marigold	Melon	Nasturtium	Onion	Oregano	Parsley	Peas	Peppers	Rosemary	Sage	Spinach	Squash	Strawberries	Sunflowers	Swiss Chard	Thyme	Tomatoes
Basil																														
Beans																														
Broccoli																														
Carrots																														
Cauliflower																														
Chives																														
Cilantro																														
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Peas																														
Peppers																														
Rosemary																														
Sage																														
Spinach																														
Squash																														
Strawberries																														
Sunflowers																														
Swiss Chard																														
Thyme																														
Tomatoes																														

■ Plants grow well together ■ Don't plant together! ■ Beneficial to garden in general
■ Combination helps bug control ■ Carrots will have good flavor, but stunted roots

Crop Rotation

• Successive plantings of the same crops for years will lead to nutrient depletion, disease and pest buildup, and poor harvests

• Crop rotation keeps the soil fresh and uses each plants strengths to ensure nutrient depletion and disease buildup are kept minimal



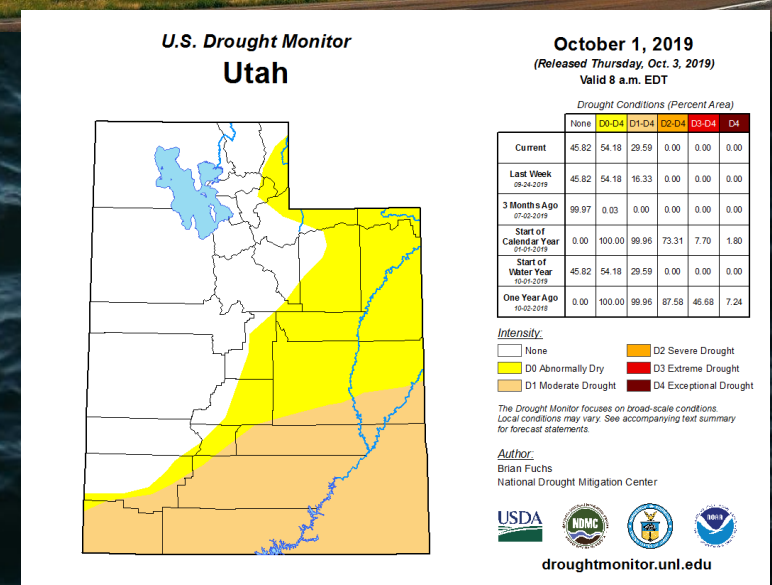
Mulching

- Mulches help gardens fight off weeds, retain moisture, and adds nutrients
- Mulches can be wood chips, compost, newspaper, grass clippings, straw, or any other slow to degrade organic materials; spread out at least 1" deep
- If attempting to regrow grass in an area where your pets tend to roam, plant the grass seeds and lay down an inch of straw or hay to protect the seedlings



Water and Irrigation

- A necessity of life - water for family, garden, and livestock is vital to success
- Utah has periodic droughts requiring us to “slow the flow” on public water usage, however according to our state water conservancy department and natural resources conservation service we do have plenty of water flowing into the state for our needs and wants; the biggest reason for these cutbacks is most of our state’s water is sold and piped out to Nevada, California, New Mexico, Arizona, Mexico and these contractual obligations must be met, followed by commercial farms and businesses; so homes are the first end users asked to cut back
- Ensuring a steady water supply will ensure self-reliance and good harvests; bare minimum water storage for emergencies is one gallon per person, per day; having hundreds of gallons on hand plus the means to collect more ensures your family’s independence



Flexible PVC Pipe

Carries water from skimmer to Aquafalls filter. Makes installation easier.

Extension Tube

Optional - Allows skimmer to sit back from edge of pond making it much more natural looking.

Skimmers

Hide pump & plumbing from view. Greatly reduces pond maintenance by skimming debris from surface. Provides an ideal spot for an automatic fill valve which replaces water lost due to evaporation.

Aquafalls Filter

Bury in the ground and when installed properly are completely hidden from view. Filters require minimal (usually once per year!) cleaning and keep the pond sparkling clean. Filter tubs also provide an ideal base for waterfalls and streams.

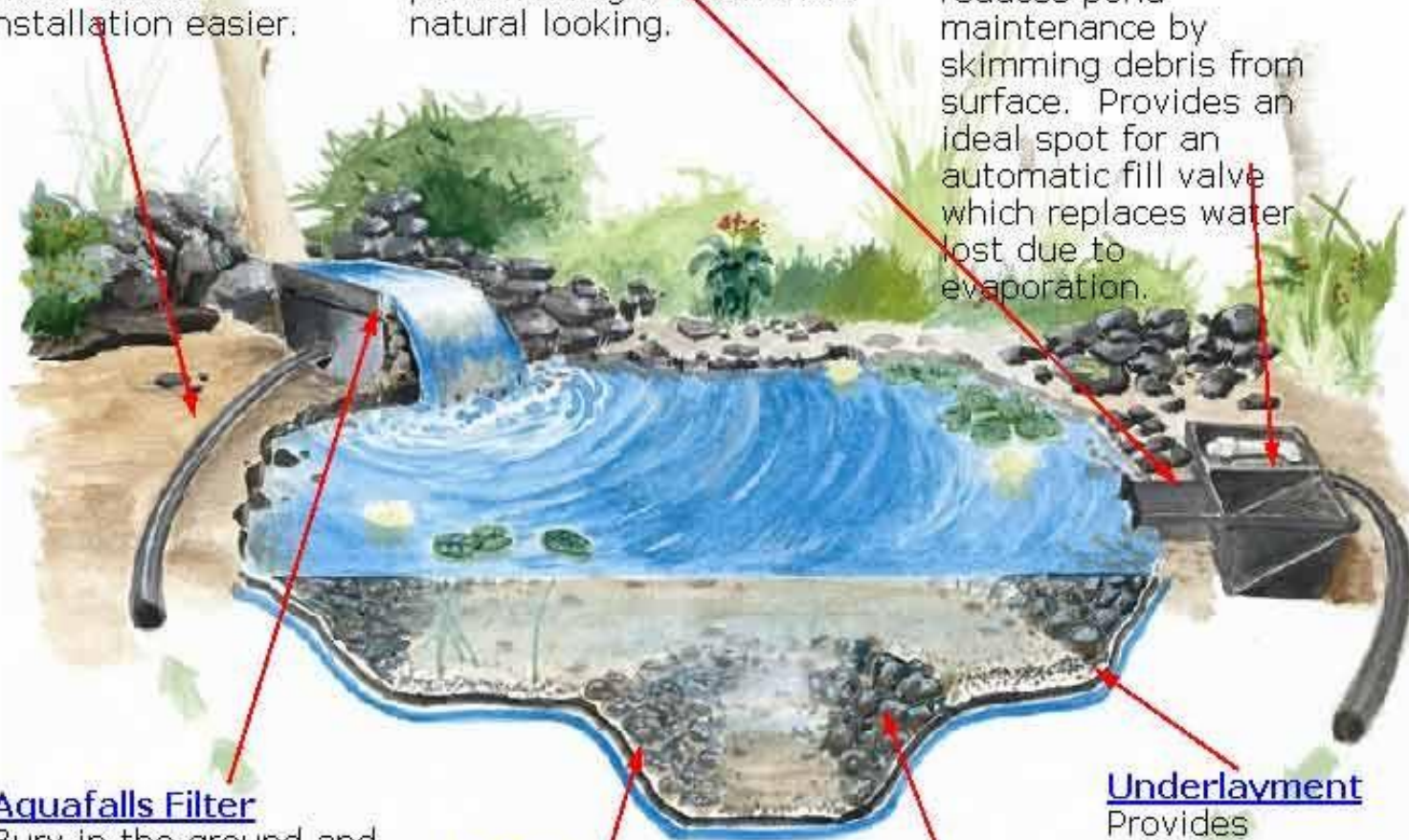
45 Mil Rubber Liner

Strong yet flexible - liners have 20 year warranty.

Underlayment

Provides protection against punctures in liner from sharp rocks or tree roots.

Optional - Covering liner with rocks and gravel provides additional surface area for bacteria, also hides and protects liner. Rocks and gravel look more natural than bare liner.



Collecting Rainwater

•Collected rainwater lowers your costs in the long term, but the water is still contaminated from the collection surface and any pollutants in the atmosphere, and if done from a non-metallic roof will also have tar and other chemical contaminants

•A simple 50' tarp with a hose or drain in the center collects gallons per minute in a moderate rainstorm; permanent structures made of a wood frame, corrugated metal, and gutters will supply the home regularly

•If wanting to cleanse for drinking: a simple, homemade sand and coal filter will remove most pollutants, but it's also good to disinfect with $\frac{1}{2}$ teaspoon of unscented bleach for every 5 gallons of water, and let sit for an hour; boil for 20 minutes if doing small amounts, or run through a distiller for better purity

•Harvesting and storing rainwater is legal in Utah with registration; sign up online for a FREE water right for 200 gallons above ground maximum, 2,500 gallons underground maximum

<http://waterrights.utah.gov/forms/rainwater.asp>





Online Services

Agency List

Business

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Search

Utah Division of Water Rights



Rainwater Harvesting Registration

Name

Telephone: Area Code & Number

Address where rainwater is to be harvested:
(Street, RFD, Box Number)

(City, State, Zip)

Storage Size (Storage is limited to 2,500 gallons.)

- To collect, store, and place the captured precipitation to a beneficial use, a person must register the use with the Utah Division of Water Rights as detailed in 73-3-1.5.
- A person may collect and store precipitation without registering in no more than two covered storage containers if neither covered container has a maximum storage capacity of greater than 100 gallons.
- The total allowed storage capacity with registration is no more than 2,500 gallons. Collection and use are limited to the same parcel of land on which the water is captured and stored.
- There is no charge for registration.
- When you submit this form, your browser will be redirected to the Rainwater Harvesting Registration certificate, which you should print for your records.

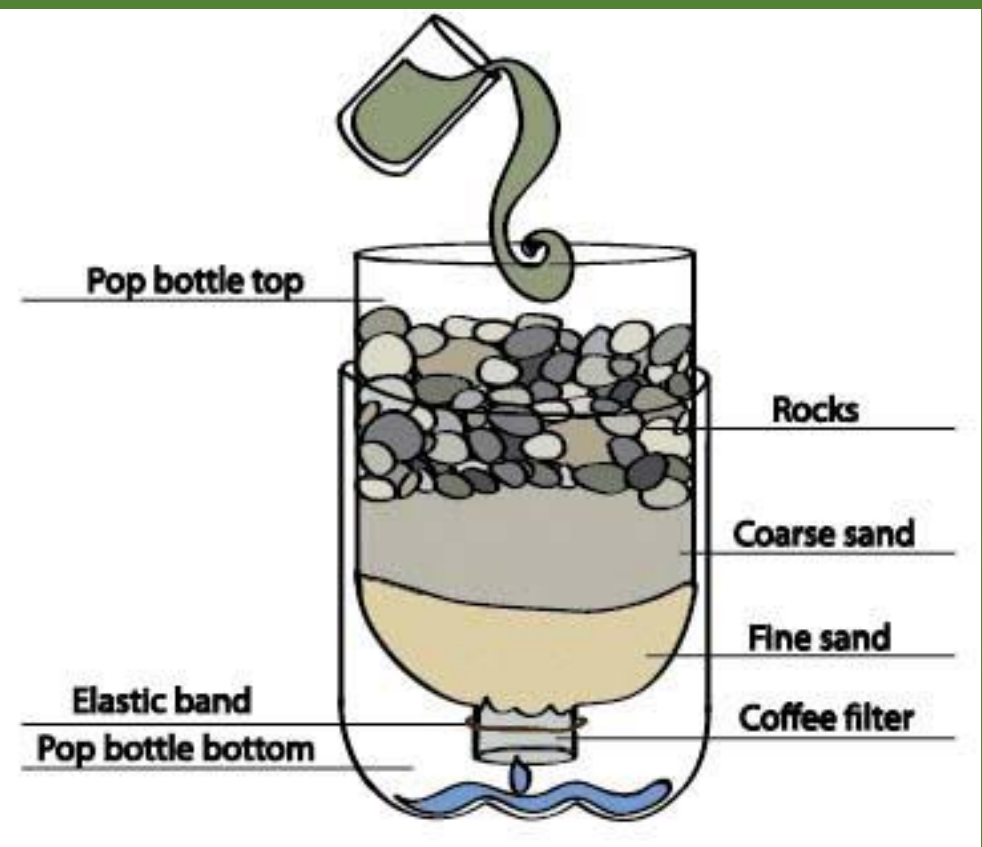
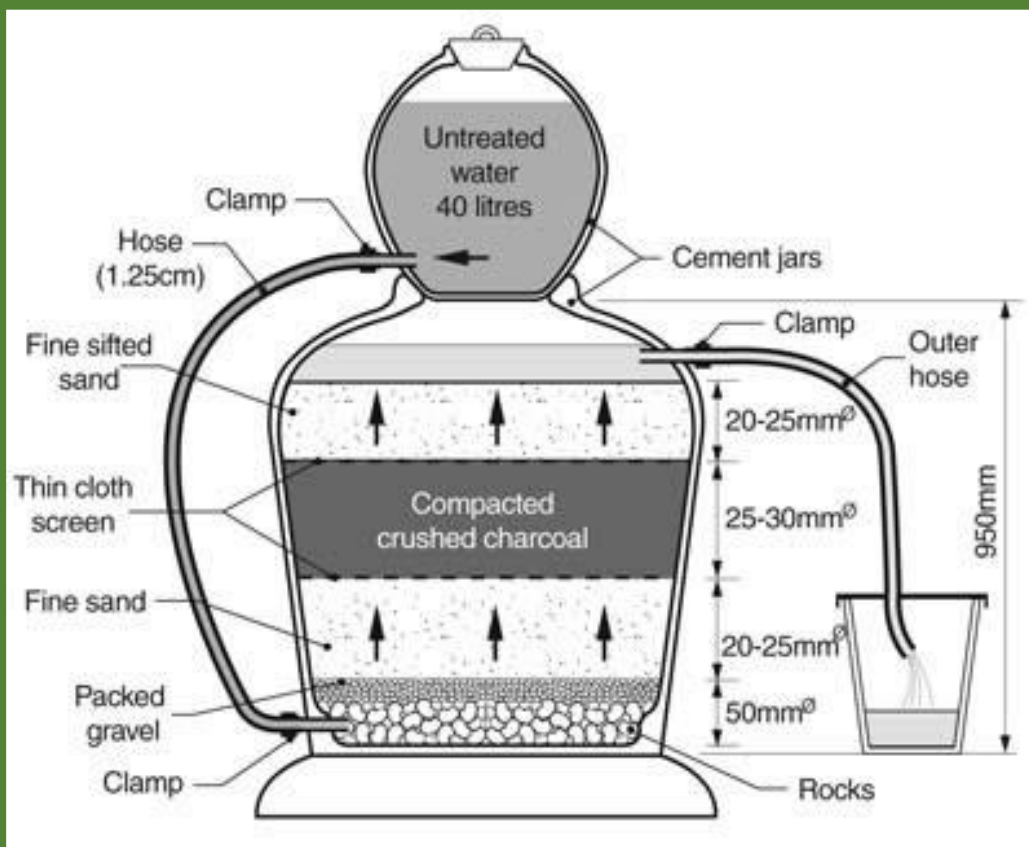
By entering your valid e-mail address below, you certify that the information entered on this form is true and correct to the best of your knowledge.

E-mail address :

List of Registrations

Cancel

Submit

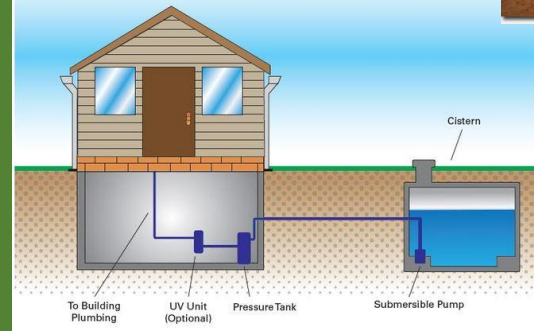
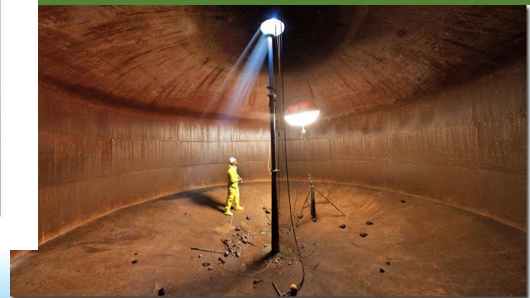
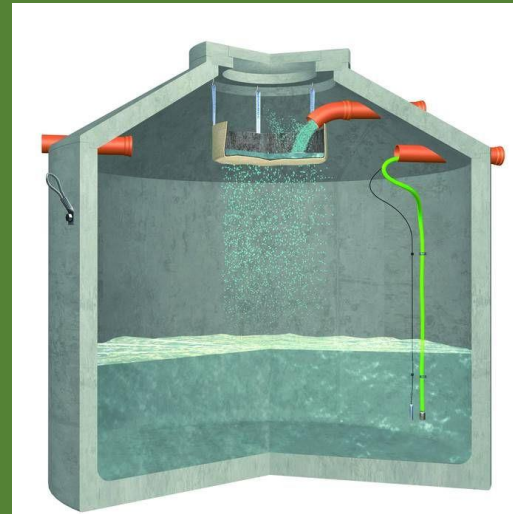


Sand - untreated
 Charcoal- purified
 Gravel
 Empty – Clean Bucket



Cisterns

- In the old days, cisterns were made of concrete with sealant and built into the home's foundation; today PET plastic cisterns and fiberglass coated with inert sealant models are available
- Make your own buried cistern: first, research what material would be best for your situation; obtain a building permit and call Blue Stakes at 811; in our area, buried cisterns can hold 2,500 gallons maximum; sink a pre-made cistern or build one into the ground with the ceiling at least 4' submerged to prevent freezing; a filter is necessary to keep out soil, debris, insects and rodents – change regularly; both the inlet and outlet must be from the top – no openings whatsoever are allow from the bottom or sides as harmful algae and bacteria can grow in the crevices
- Always filter and sanitize water before drinking



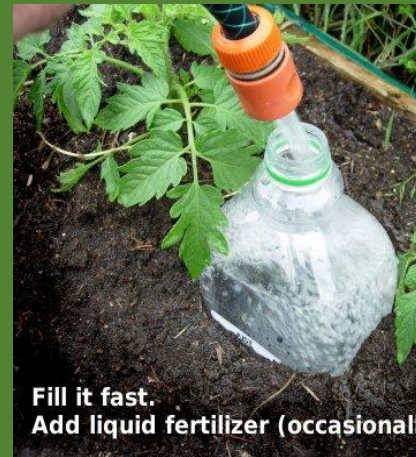
Water Towers and Tanks

- Above ground tanks and towers are restricted to 200 gallons; towers cannot exceed 8' in height
- Tanks have a disadvantage of freezing during the winter, but insulating and adding a pond heater will compensate; and material costs are lower with tanks than with cisterns as tanks only need to hold in the water and not also support hundreds of pounds of soil
- Tanks also need filters to keep debris, soil, and rodents out; towers, since they need taps built on the side or bottom of the tank require more intense filtration and sanitation before drinking



Drip Irrigation

- Utilizing gravity to feed water through tiny holes; this is the easiest do-it-yourself irrigation system to construct and manage
- From a simple punched bottle in the ground, up to timed systems attached to the home's water system – the varieties are numerous
- Depending on your system, this can also be time consuming to refill

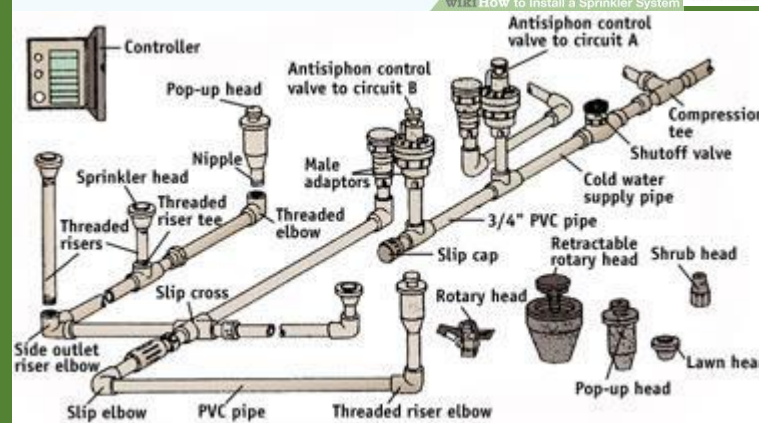
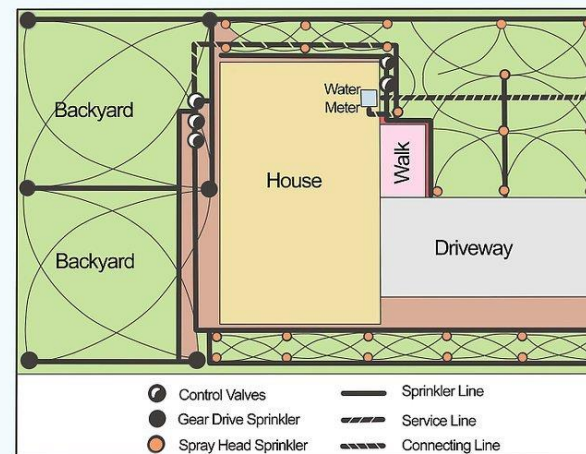


Sprinkler Irrigation

•The home's water supply providing the proper psi, sprinklers propel small water droplets in a broad area for a low cost

•A buried sprinkler system is fine for a lawn and can be expensive, but productive food gardens and flower beds require a removable sprinkler system

•To build an elevated sprinkling system: gather a 5/8" garden hose, 1/2" galvanized T junctions and 1/2" X 3" long pipes, full spread sprinkler heads, a 1/2" spigot, several worm gear hose clamps, 3/4" rebar at least 4' long, and some rust proof wire; weld a T junction to the end of a rebar in a inverted T shape; cut the garden hose to 3' lengths and clamp to each T junction, followed by the 3" pipes and sprinkler heads; attach the spigot to the end of the line with some hose and a clamp – this will be a drain; on the other end attach the remaining hose with the female coupling sticking out – use this to attach the water supply



Which Plants to Grow

.After planning what kind of garden will work for your home, and preparing all the support for the plants; now the fun part - start planting your garden

.“Every herb in the season thereof, and every fruit in the season thereof; all these to be used with prudence and thanksgiving.” D&C 89:11

.“All grain is good for the food of man; as also the fruit of the vine; that which yieldeth fruit, whether in the ground or above the ground” D&C 89:16



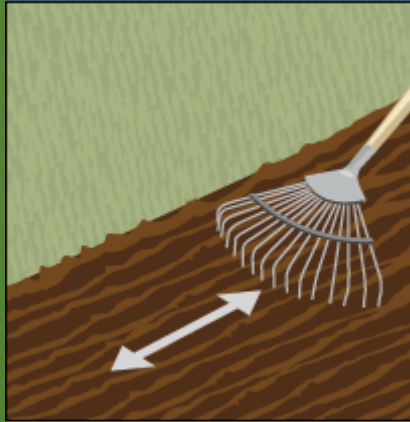
Grains in the Garden

- Grains are one of the simplest and easiest crops to grow – if you can grow a lawn, you can grow grains
- A space of 1000 sq/ft (500 ft X 500 ft plot) will grow about 60 pounds of grain average; this varies by variety of grain grown and soil type; it doesn't sound like much, but can make about 90 loaves of wheat bread
- Oats, from seed to harvest takes 2 months (fastest of all grains), possible to get 3-4 crops in a season
- Till soil to a fine, level consistency and plant by either broadcasting the seeds or in $\frac{1}{2}$ " deep holes, 1' apart with one small handful of seeds to ensure maximum yield
- Use chemical fertilizers like 15-15-15 and 21-0-0, or premix in compost/manure; don't use lawn fertilizers with pesticides and herbicides – they won't do crops any good and could poison the plants and consumers
- Plant winter varieties in September – October (mow any tall sprouts to about 4"; will grow grains in spring); plant spring varieties in March



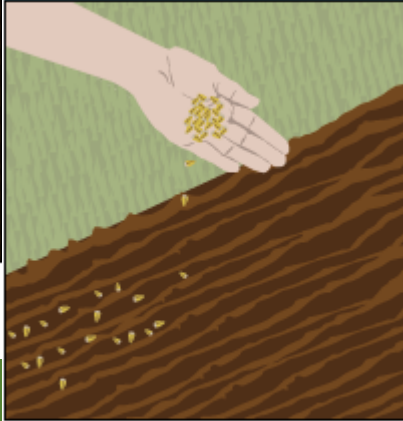
How to Grow Wheat

HOW TO GROW WHEAT



Prepare the ground by finely raking the soil as you would to plant grass.

HOW TO GROW WHEAT



Scatter the wheat seed evenly by hand and rake over. Consider a bird-scaring device.

HOW TO GROW WHEAT



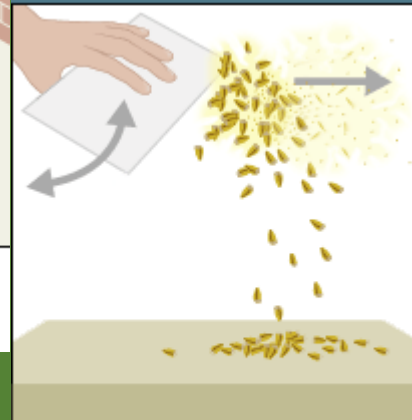
Harvest with sickle or scythe. Leave 2-3 inches of stubble. Tie stalks into sheaves.

HOW TO GROW WHEAT



Thresh by placing sheaves into pillow cases and hitting against brick wall.

HOW TO GROW WHEAT



Winnow by throwing wheat and chaff up into breeze from fan. Chaff should blow away.

Wheat can be cut using a kitchen knife if no scythe or sickle is available

Ensure a 14.5% moisture content to avoid spoilage - look online for a microwave moisture testing method; store in an airtight container with oxygen absorbers

Hay and Pasture Grass

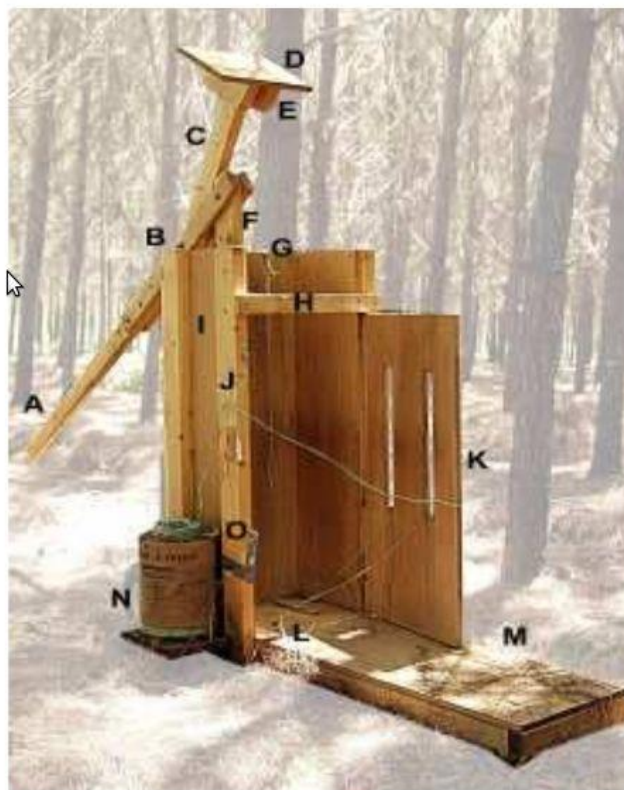
- If economic problems, civil unrest, wars, and natural disasters get bad then replacing your lawn with pasture and legume hay would help long term
- Majority of our lawns is Kentucky Bluegrass, which is edible for small livestock if grown taller with appropriate animal safe herbicide use and cut before seed heads mature, but is very low yielding as cut hay
- Adding Timothy, orchard grass, tall clover, alfalfa completes most animal needs and works as cut hay stored over winter
- In a pinch, spreading a bag of basic bird seed on your lawn will yield great grazing results in a couple weeks, but might not keep over winter as cut hay
- A wooden homemade hay baler is simple and cheap to make
- If allergies are an issue, the alternative is growing feed hydroponically, but this method does not produce replacement seed



Forage Type	Pros	Cons	Peak Growth						
Arrowleaf Clover	<ul style="list-style-type: none">High yieldAdapted to well drained sitesGood choice for blends with crimson clover to extend grazing season	<ul style="list-style-type: none">Disease resistance (Apache is more resistant than Yuchi)Not tolerant of low pHCan delay early growth of overseeded perennial grassesLimited seed availabilityLimited Pre-inoculated seed	April-May	Forage Crop	Pounds seed per bushel	Approximate number seeds per pound	Seeding rate pounds/acre	Seeding depth inches	Seedling vigor
				GRASSES:					
				Bahiagrass	46	273,000	15-20	¼ - ½	P
Ball Clover	<ul style="list-style-type: none">Excellent reseeder even with close grazingAdapted to a wide range of soil types: more tolerant of wet soilsRelatively inexpensive seed	<ul style="list-style-type: none">Lower yield than other cloversNot tolerant of low pHLimited seed availability	March-April	Barley	48	14,000	90-120	1-2	G
				Common hulled Bermudagrass	40	2,070,000	5-10	0 - ½	F
				Browntop Millet	14	140,000	25-30	½ - 1	E
Crimson Clover	<ul style="list-style-type: none">Most dependable cloverHigh yieldsGood reseeder if managed to allow seed developmentAdapted to well drained sitesEarly season growthGood choice for providing nitrogen to warm season pastures	<ul style="list-style-type: none">Can delay early growth of overseeded perennial grassesChallenging to manage for reseeding when used in blends because it matures right at peak of ryegrass production	February-March	Crabgrass	25	825,000	8-12	¼ - ½	G
				Dallisgrass	14	300,000	10-15 (PLS)	¼ - ½	P
				Foxtail Millet	50	213,000	20-30	¼ - ½	E
Red Clover	<ul style="list-style-type: none">High yieldsLate season of growth complimentary in blends	<ul style="list-style-type: none">Weak reseederEasily damaged by overgrazing (longer rest period needed)	April-May	Johnsongrass	28	119,000	20-30	½ - 1	G
				Oats	32	15,000	90-120	1-2	E
				Orchardgrass	14	416,000	15-20	¼ - ½	F
White Clover	<ul style="list-style-type: none">Adapted to wetter sitesFair seed producer that flowers over an extended periodLate season of growth complimentary in blends	<ul style="list-style-type: none">Not drought tolerantCan delay early growth of overseeded perennial grasses	May-June	Pearl Millet	48	82,000	20-30	½ - 1	E
				Rescuegrass	10	52,000	20-30	0 - ½	P
				Rye	56	18,000	90-120	1-2	E
Medic	<ul style="list-style-type: none">Adapted to a wide range of soil types: more tolerant of wet soils than crimsonExcellent reseeder	<ul style="list-style-type: none">Lower productivity than cloversPoor tolerance of low pHLimited seed availability	March-April	Annual Ryegrass	24	224,000	20-30	¼ - ½	G
				Sorghum	50	24,000	15-20	1-2	G
				Sudangrass	45	43,000	30-40	½ - 1	E
Vetch	<ul style="list-style-type: none">High yieldDisease resistanceWorks well in blendsGood reseeder if managed to allow seed developmentAdapted to well drained sitesMore tolerant of low pH soils	<ul style="list-style-type: none">Easily damaged by overgrazingLimited commercial varietiesLimited seed availabilityRequires specific inoculantSeed is expensive	March-April	Switchgrass	55	280,000	5-6 (PLS)	¼ - ½	P
				Tall Fescue	25	227,000	15-20	¼ - ½	F
				Timothy	45	1,152,000	6-8	¼ - ½	F
				Triticale	48	15,000	90-120	1-2	G
				Wheat	60	11,000	90-120	1-2	E

Hand Hay Baler Plans

(from the 'East Texas Pine Straw' Website)

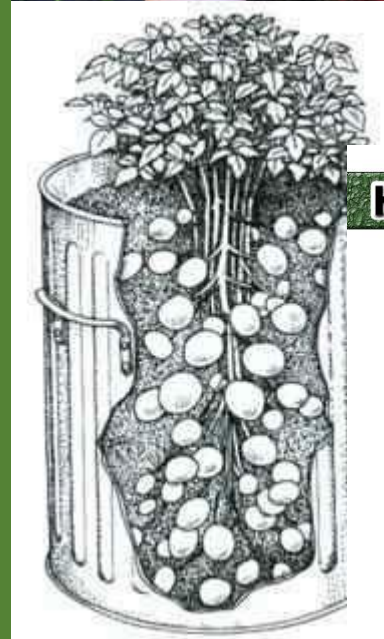


Part	Description	Stock (inches)	Length (inches)
A	Handle	2 x 3	50
B	Lever	bolt 1-2 2 x 3	9.5
		bolt 2-3 2 x 3	7.0
C	Compressor Arm	2 x 4	24
D	Compressor Pad	1/2 plywood	10.5 x 12.5
E	Pad supports	2 x 4	10.5
F	Lever fulcrum	2 x 4	20
G	String holder see Fig. A-2	Nails	2.5
H	Front brace	2 x 2	18
I	Plywood sides	1/2 plywood	43 x 12
	Plywood back	1/2 plywood	43 x 15.5
J	Corner Supports	2 x 4	43
K	Door	1/2 plywood	15.5 x 38
L	String retainers see Fig. A-3	I-bolts	1
M	Deck	1/2 plywood	59 x 15.5
N	String	nylon	

Figure A-1. Illustration of a typical, easy to construct hand-powered, box baler showing the main components.

Potatoes and Tubers

- Unlike most crops, potatoes retain and sustainably store vitamin C and other unstable vitamins long term
- Propagate by placing seed potatoes in a moist, lighted area to encourage short and firm sprout growth; plant 4 inches in rich soil
- Potato plants grow as a vine; the new tubers developing above the original seed potato, so piling soil above the original mound is necessary – harvest by digging with a garden fork, not a shovel
- Use extra fertilizers for better harvests



HOW TO GROW POTATOES IN BAGS STEP BY STEP

HAPPYHOUSEANDGARDEN.COM



credits to how-to-grow-potatoes.co.uk

- Instead of growing potatoes in long rows and taking up space; potatoes grow better in boxes, buckets, garbage cans, and burlap bags
- Theoretically, using this method a family of 4 can grow all their needs in a 16' X 16' space; 4 boxes per adult
- Rotate where the boxes are each year for 4 years to prevent pathogens
- The potatoes do not need consistent removal from the bottom up and can be left until harvested all at once
- Store potatoes in a dry sand filled bin or in a clamp; make sure they don't touch each other
- Another method combines traditional rows with high wooden sides; produces even more crops

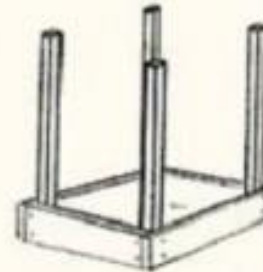
How to Grow 100 Pounds of Potatoes in 4 Square Feet



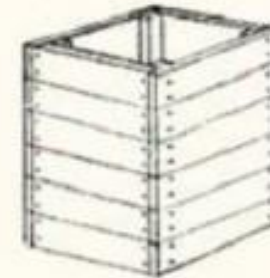
HOW TO BUILD AND USE YOUR POTATO BOX

Materials:

Six 2-inch by 6-inch boards eight feet long
One 2-inch by 2-inch board 12 feet long
2 1/2-inch wood screws (96 of them)
(You can use pine, cedar or redwood, which will resist rot longer.)



1. Cut the 2-by-2 into four lengths of 33 inches.
2. Cut the 2-by-6 boards into 12 lengths of 21 inches, and 12 lengths of 24 inches.
3. Pre-drill the screw holes in the 2-by-6 boards and attach the bottom row on the 2-by-2s.
4. Place over prepared soil and fill with soft soil or mulch, planting potatoes four inches deep.



5. When the vines are about 12 inches above the soil, add another board and fill with dirt, being careful not to cover more than one-third of the plant. Repeat this until the box is completed.



6. To harvest your potatoes, remove the screws from the bottom board and carefully reach in for the potatoes. Next time you need potatoes, remove the second board and "rob" spuds from that level.

Beans and Legumes

- Greatest quantity of proteins compared to any other crops
- Requires no nitrates after sprouting – the plant pulls it out of the air and injects excess nitrogen into the soil
- Beans come in two types: bush and pole; bush varieties support themselves and grow up to 3' tall, pole types grow up a trellis structure 7'+ but will stop producing pods if older pods dry out for seed
- Sow seeds 1 foot apart fertilized with manure or Triple-16; when ready to harvest, pull entire plant and hang to dry, shell into container; for green beans, pick daily until plant is finished



Purple Podded
Pole



Yellow Eye



Cherokee Trail
of Tears



Gold of Bacau



Hidasta Shield
Figure



Black Valentine



Jacob's Cattle



Orca



Lingua di Fuoco



Jembo Polish



Tsunetomi



Sturgill White
Square House



French Duet



Rattlesnake
Pole



Royal Burgundy



Malibu



Santa Ana



Carolina
Greasy Pole



Garden Vegetables

- Vegetables are the non-fruiting parts of a plant, though we do consider some fruiting bodies as vegetables
- Nutritionally, most vegetables fall into two general categories: orange and green; both providing their own nutrients and effects on the human body
- If growing pumpkins and other squash vines on the ground; rotate the vines in a circular pattern everyday; when the maximum space desired is achieved, pinch the ends of the vines to stunt their growth and focus on growing gourds
- Most vegetables grow in 2 months; attempt an early variety of one vegetable - harvest in the summer, then plant a late growing crop – harvest in the fall



Culinary Herbs

• Growing herbs and spices helps your budget and cooking prowess; providing flavor and added nutrition to dishes

• Herbs and spices in the garden also guard against pests and disease

• Growing garlic near doors and windows will repel mosquitoes from a home's entryways



Medicinal Herbs

- Many culinary herbs also contain medicinal properties
- Aloe Vera and Myrrh are two of the best medicine plants in the world
- Other useful herbs are Valerian, Wormwood, St. John's Wort, White Willow Trees (bark), Fever-few, and dozens more
- Use with skill and care; sometimes the cure is just as bad as the disease
- Cannabis and cacao shrubs are NOT legal to grow and they damage/toxify soil, though there is pressure on the legislature to legalize; tobacco growing has the same issues

Health Benefits of Aloe Vera

- Detoxify the body
- Hydrates the skin
- Lowers high cholesterol
- Supports immune system
- Stabilizes blood sugar
- Soothes arthritis pain
- Protects the body from stress
- Prevents kidney stones
- Cooling and repairing sunburn skin
- Reduces high blood pressure
- Strengthens gums and promotes strong and healthy teeth
- Heals the intestines and lubricates the digestive tract
- Prevents and treats Candida infections
- Boosts cardiovascular performance and physical endurance
- Helpful in curing blisters, insect bites and any allergic reactions, eczema, burns, inflammations, wounds and psoriasis

In ancient times, aloe vera and its extracts were used for medicinal purposes. Today, researchers are discovering more advantages of this versatile plant.



RawForBeauty.com

Myrrh

immune support
analgesic
expectorant
eczema
candida
asthma
antispasmodic
athletes foot



NATURAL REMEDY REFERENCE GUIDE

www.greentidings.org
www.facebook.com/GreenTidings

Cold/Flu

- ☐ Probiotics
- ☐ Garlic
- ☐ Elderberry syrup
- ☐ Apple cider vinegar
- ☐ Vitamin C
- ☐ Hydrogen Peroxide in ears
- ☐ Oil of Oregano
- ☐ Eucalyptus Oil (external)
- ☐ Peppermint
- ☐ Vitamin D

Digestive Issues/Ulcers

- ☐ Probiotics
- ☐ DGL
- ☐ Vitamins A, C, E
- ☐ Co-Q10
- ☐ Zinc
- ☐ Silica
- ☐ L-Glutamine
- ☐ Cabbage Juice
- ☐ Linoleic Acid
- ☐ Celery
- ☐ Cucumber
- ☐ Kale
- ☐ Peppermint
- ☐ Ginger

Anxiety/Stress

- ☐ L-Theanine
- ☐ Cherries
- ☐ Chamomile
- ☐ Skullcap
- ☐ Kava Kava
- ☐ Passion Flower
- ☐ Valerian
- ☐ Lemon Balm
- ☐ Rescue Remedy
- ☐ 5-HTP
- ☐ GABA
- ☐ Magnesium

Heartburn/GERD

- ☐ Probiotics
- ☐ DGL(Deglycyrrhizinated Licorice)
- ☐ Co-Q10
- ☐ L-Glutamine
- ☐ Silica
- ☐ Peppermint
- ☐ Ginger

High Blood Pressure

- ☐ Apple cider vinegar
- ☐ Celery
- ☐ Cucumber
- ☐ Co-Q10
- ☐ L-Glutamine
- ☐ Calcium/magnesium
- ☐ Garlic
- ☐ Primrose oil
- ☐ Cinnamon

Arthritis

- ☐ Turmeric
- ☐ Omega-3 Fatty Acids
- ☐ Epsom salts (external)
- ☐ Alfalfa seeds
- ☐ Cinnamon
- ☐ Ginger
- ☐ Vitamins C and D
- ☐ Olive oil
- ☐ Green tea
- ☐ Glucosamine
- ☐ Selenium
- ☐ Onions and leeks
- ☐ Tart cherries, black raspberries, grapes, and eggplant

Seasonal Allergies

- ☐ Probiotics
- ☐ Quercetin
- ☐ Apple cider vinegar
- ☐ Turmeric
- ☐ Honey
- ☐ Saline nasal rinse
- ☐ Omega-3 Fatty Acids
- ☐ Stinging Nettle
- ☐ Butterbur
- ☐ Peppermint

Common Name	Common Uses	Parts Used	Climate Zones
Aloe	Burns, Sunburn	Leaf Gel	8, 9. 12-24
California Poppy	Sedative, Hypnotic	Aerial Parts in the Flowers	All Zones
Catnip	Cold, Flu	Leaves and Flowers	All Zones
Centaury	Bitter Digestive Tonic	Aerial Parts in the Flowers	40779
Chamomile	Indigestion, Sedative	Flowers	All Zones
Cleavers	Lymphatic Tonic	Leaves and Flowers	
Comfrey	Wounds, Use Externally	Leaves	All Zones
Dandelion	Diuretic, Liver Tonic	Leaves and Roots	All Zones
Echinacea	Immune System Support	Whole Plant [In Flower]	All Zones
Elder Flower	Influenza	Flowers	
Fennel	Colic, Gas	Seeds	
Feverfew	Migraine	Leaves	All Zones
Fumitory	Eczema	Aerial Parts in the Flowers	
Garlic	Cough, Colds, Infection	Bulb	All Zones
Lavender	Calminative	Flowers	3 thru 24
Marigold	Wound Healing	Flowers	3, 8-10, 12-24
Meadowsweet	Digestive Tonic	Aerial Parts in the Flowers	
Nettle	Tonic	Aerial Parts in the Flowers	
Parsley	Diuretic	Leaves and Roots	All Zones
Peppermint	Indigestion, gas	Leaves and Flowers	All Zones
Raspberry	Astringent	Leaves and Fruit	3-6, 15-17
Red Clover	Skin Conditions	Flower Heads	3 thru 24
Ribwort	Bronchitis	Leaves	
St. John's Wort	Sedative, Analgesic	Aerial Parts in the Flowers	
Skullcap	Nerve Tonic	Aerial Parts in the Flowers	
White Horehound	Unproductive Cough	Leaves and Flowers	All Zones
Wood Betony	Tension Headaches	Aerial Parts in the Flowers	
Yellow Dock	Skin Conditions	Roots	

Perennials

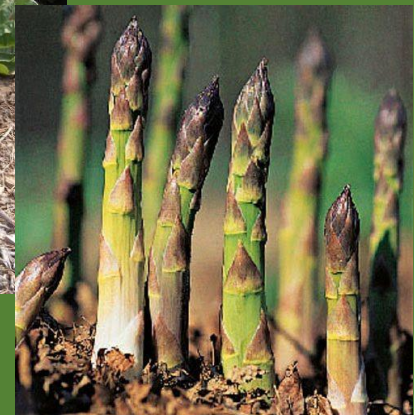
.Most garden produce is grown from annuals (plant dies at end of growing season) - perennials regrow year after year; providing a stable food source

.Examples are artichokes, asparagus, rhubarb, strawberries, etc. some perennials are prolific, such as strawberries; but some, like artichokes, do not have a high return on investment

.Rhubarb requires a period of “forcing”; this is when the plant is covered with a metal bucket or light blocking tarp to prevent the plant from reaching light – this forces the rhubarb to grow long, thick stems

.Asparagus is an early spring vegetable; take several cuttings until summer but leave the last shoots to grow tall and spread fern-like leaves to gather energy for next year

.Cold hardy prickly pears, a succulent fruit, grows well in our area; needs extra drainage in the soil, and high heat to flower



Fruit Brambles, Bushes, and Vines

- All are perennials; they provide a steady, yearly food supply
- Most brambles and shrubs will last for 30 years; grape vines can thrive for hundreds of years
- In the case of brambles (raspberries, blackberries, etc.) be sure to grow them in a sectioned off area or their suckers will spread everywhere; prune the dead branches off at the soil level – never cut in the middle
- New grape vines should be pruned back leaving only 2 feet of new growth; the first year prune into two main branches, in the 4th year allow four branches to remain growing out from the original two; keep pruning back as the vine will grow better fruits if kept trimmed and short



HOW TO GROW Hydroponic Strawberries

Best Varieties For Hydro

- Day neutral
- Everbearing



Propagation

- Rootstock
- Runners
- Difficult to start from seed

Best Hydro System

Strawberries grow especially well in NFT and vertical hydroponic systems.



Temperature

50-70 degrees. Plant's benefit from 10 degree cooler temperature at night.

Spacing

6-8 Inches



Lighting

14-16 Hours

PH

5.5-6.5



Nutrients

High nitrogen for few weeks then switch to high phosphorus and potassium for flower and fruiting.

Want To Learn More? Check Out NoSoilSolutions.com

A strawberry window garden

For those who live in an apartment or a flat, a window box or even hanging basket is a great way to bring the garden to your windowsill.

Strawberries are incredibly easy to grow and can be grown almost anywhere. The best time to plant strawberry seeds is early autumn. Plants should be planted between the end of June and September.

What you need:

- A window box or plant pots
- Potting compost
- Gravel or pebbles
- Strawberry seeds or strawberry plants



1 Preparing the window box or plant pot

Using the biggest window box or plant pot you can for your windowsill, add a layer of gravel or pebbles to the bottom, around 3cm deep. This helps with drainage. Make sure that the box is fully secured to the windowsill.

2 Adding the compost

Fill your box or pots with compost so that it sits around 4cm below the top for seeds and 5cm for plants. Pack the compost and press down on it lightly. The compost should be slightly moist but not wet.

3 Planting your strawberry seeds

Spread the seeds out evenly along the edges of your box or pot.

Place the plants around 1.5cm away from the edge of the box or pots. Ideally, strawberry plants are placed 35-40 cm apart in a plant box or one per pot.

4 Add more compost

Top up the compost so it's roughly 3cm from the top of the box or pot. Firm up the soil around each plant as you spread it out.

5 Watering the seeds or plants

Water new plants and seeds frequently. Water from the bottom to prevent rotting the crown and the fruit.



Orchard Trees

- Fruit trees are as diverse as other fruiting plants, but also can provide lumber and firewood
- Fruit trees will last for 15-20 years before going wild (growing fruit with low quality, small amounts of flesh)
- Water regularly, and prune when needed; some gardeners prune their trees into an espalier – treating the fruit tree like a hedge
- There are hardy, cold resistant varieties of citrus, olive, and tropical fruit trees that can thrive in our area; Blue Java bananas, most kumquats, some mandarin orange varieties, Mission (oil variety) and Manzanilla (table variety – requires fermentation) olive trees, and more; many need winter protection via being boxed in with insulation of straw or leaves



Nut Trees and Bushes

•Nuts, like beans and legumes, provide a source of protein with the added benefits of fats in the form of oil

•Trees take several years before producing, while shrubs take 1 – 2 years to start providing; peanuts are annuals and produce each year; walnut, pine, hazel, and peanuts are the best suited to our area

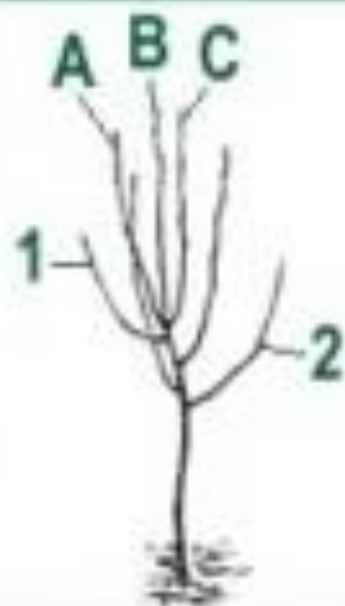
•Prune hazels every 2 years, trees every 4 years

•Local nurseries do not keep in stock so you must order online; the plants are shipped send a 1-2 year old; transplant to a pot as soon as possible, then out into the yard after a few weeks of acclimating

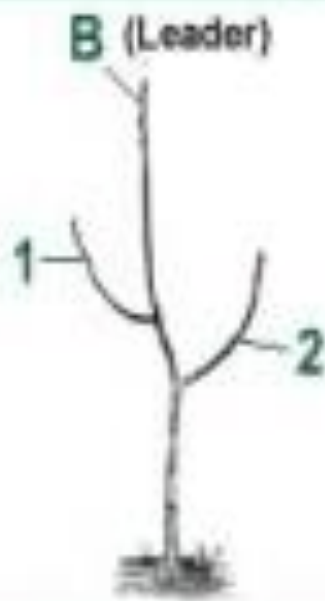


Pruning Fruit Trees

CORRECT



Tree as received from nursery



Pruned at planting

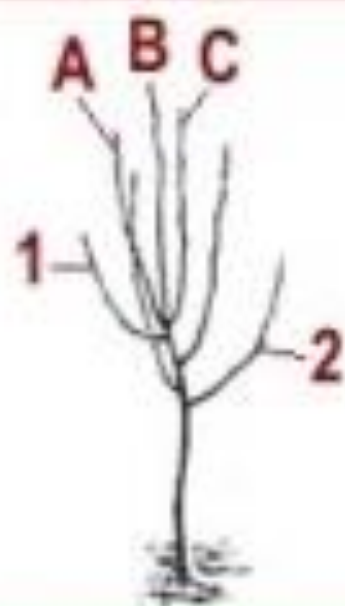


One year later



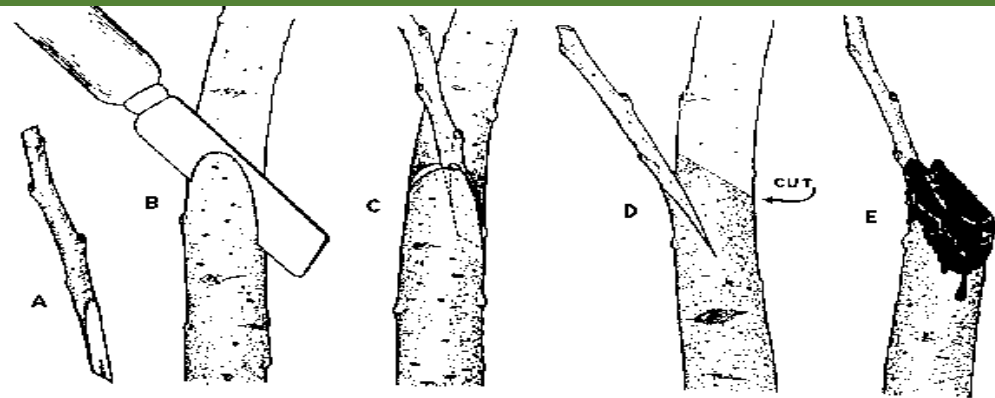
Six to eight years later

INCORRECT

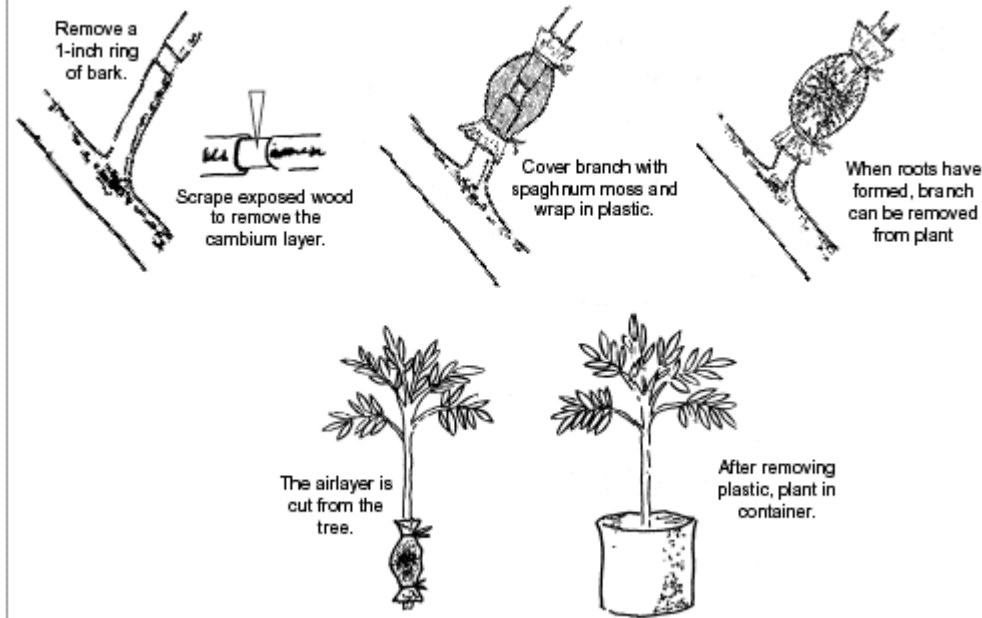


NOTICE WEAK CROTCHES Split Easily

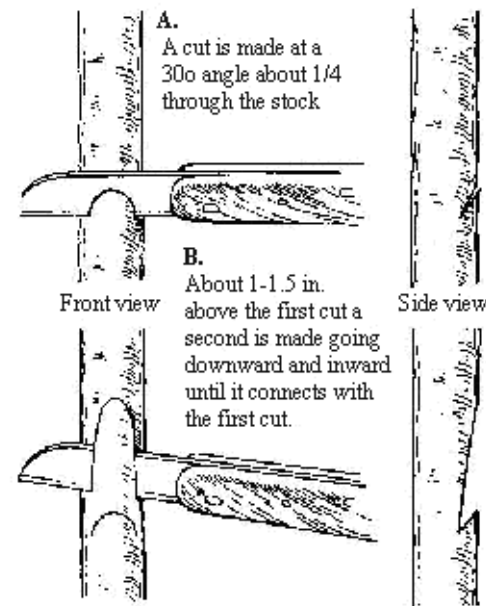
Grafting and Branch Reproduction



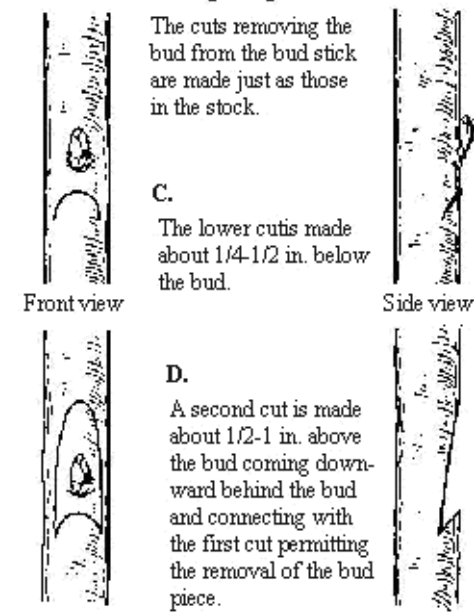
Air-layering



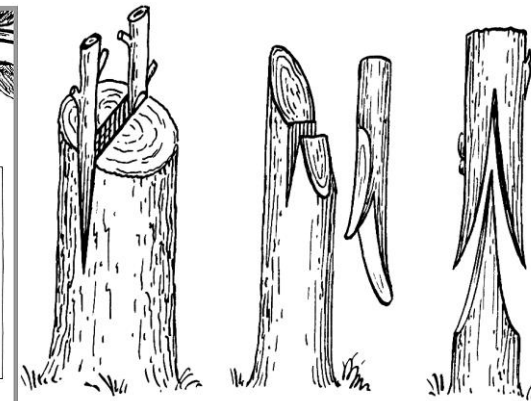
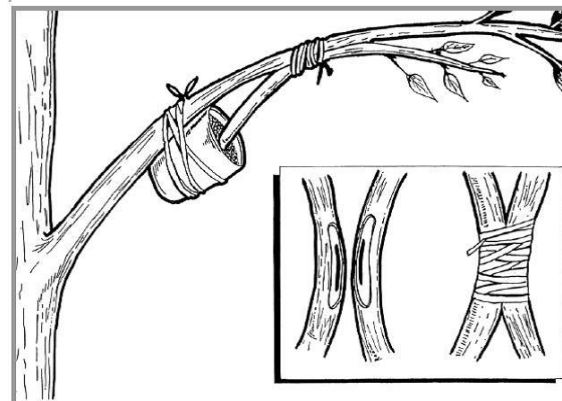
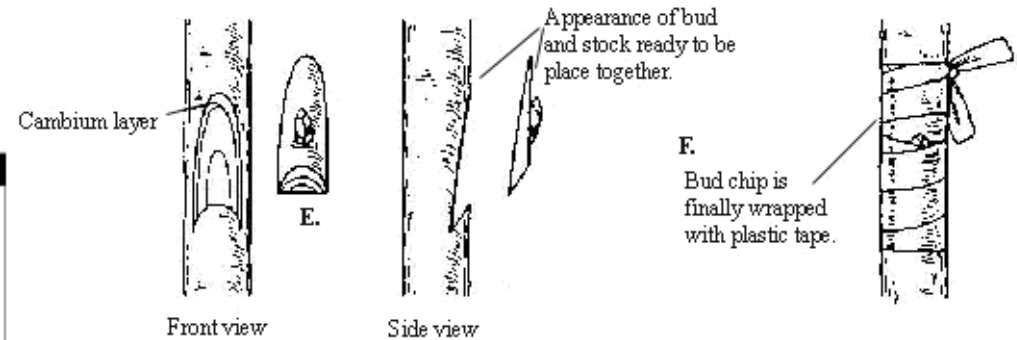
Preparing the Stock



Preparing the Bud



Inserting the Bud Into the Stock



Growing Cotton and Flax

• Growing cotton and flax in the home garden will produce enough to create your own textiles

• 25 heirloom cotton bushes yield 4 lbs. of usable fluff; a 50' x 50' plot of blue flax yields 21 ounces of product by weight; it doesn't sound very big - the average summer outfit weighs between 0.4 - 2 lbs.

• Requires a lot of specialized equipment to make raw fibers into cloth: cotton gin, flax breaker and comb, spinning wheel, loom, dyes, etc.

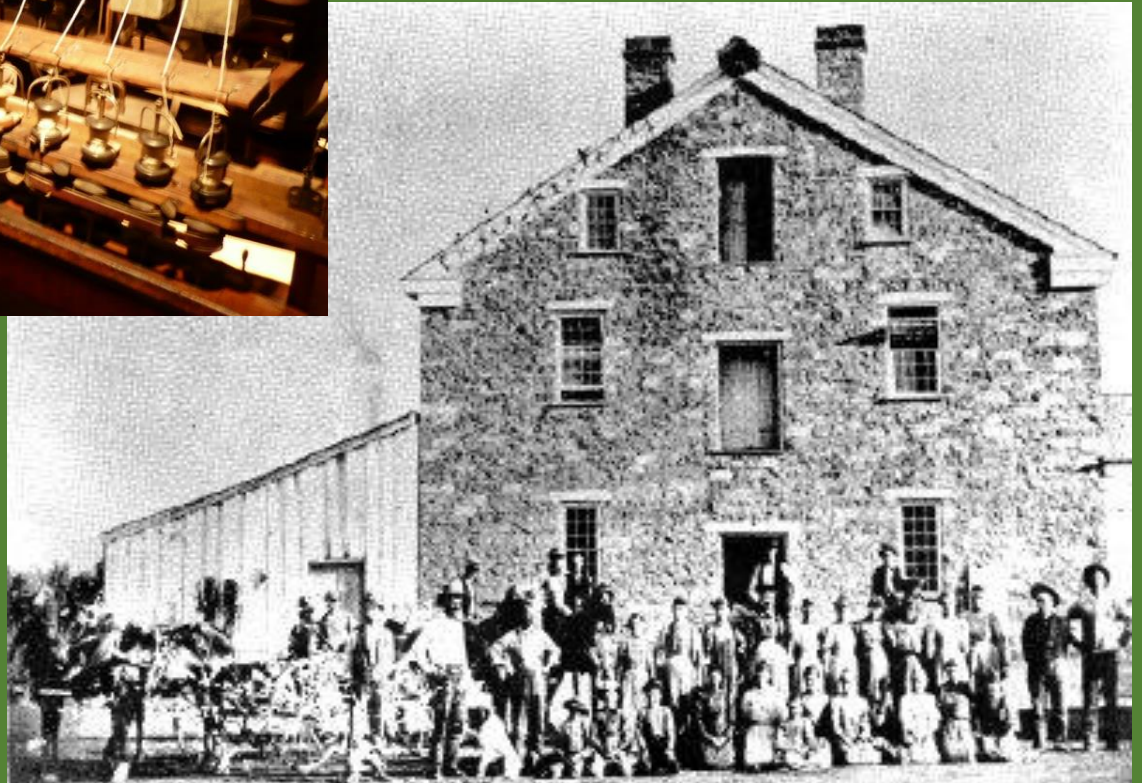
• Cotton is a tropical plant, but seems to enjoy temperate zone climates; needs 6 frost and cold free months and plenty of water; cold tolerant varieties are now available for our area; start in a greenhouse, cold frame, or cloches in January



Washington County Cotton Industry



Southern Utah during this time was nicknamed “Utah’s Dixie” in honor of the cotton missions.

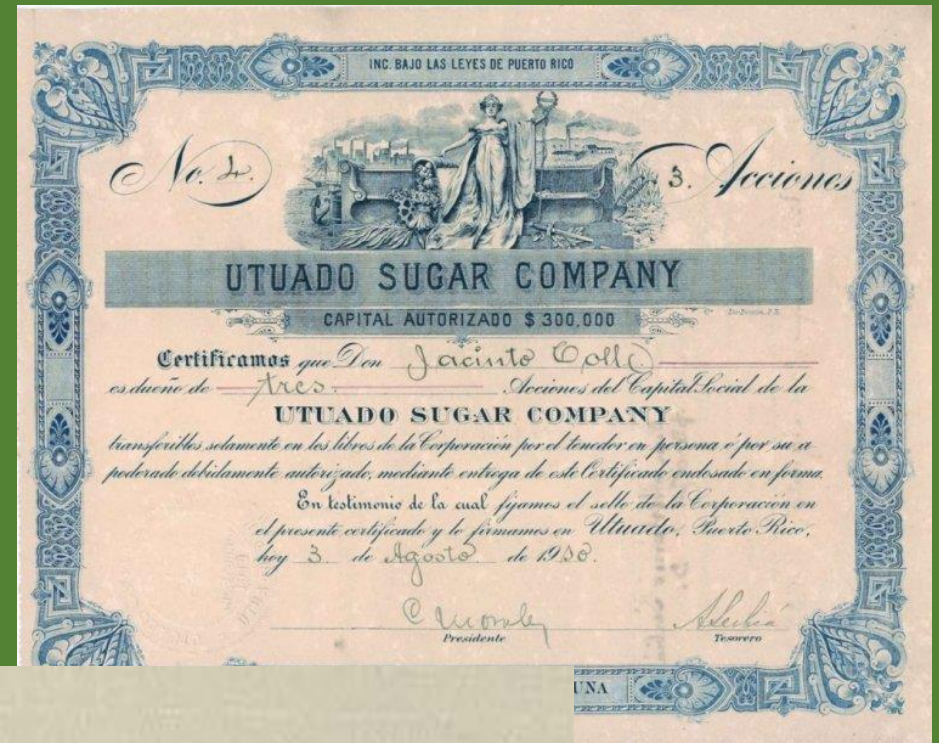


Growing Sugar Crops

- Sugar beets and maples historically grow well here; Northern Utah had a sugar industry for several decades
- A space of 15'X15' will yield an average of 82.4 lbs. of sugar from beets; 3, 10-year mature sugar maples produce 1 gallon of syrup per year
- Process through diffusion, evaporation, and crystallization into raw sugar – no other refining is really needed as most baking recipes require white and brown sugar be mixed together to the ratio they're in naturally; process the same day beets are lifted or sugars will gradually turn to starch
- Sugarcane is a tropical plant and can't adapt well to our climate



Utah & Idaho Sugar Company



Sprouting

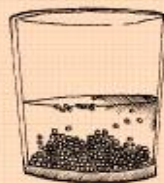
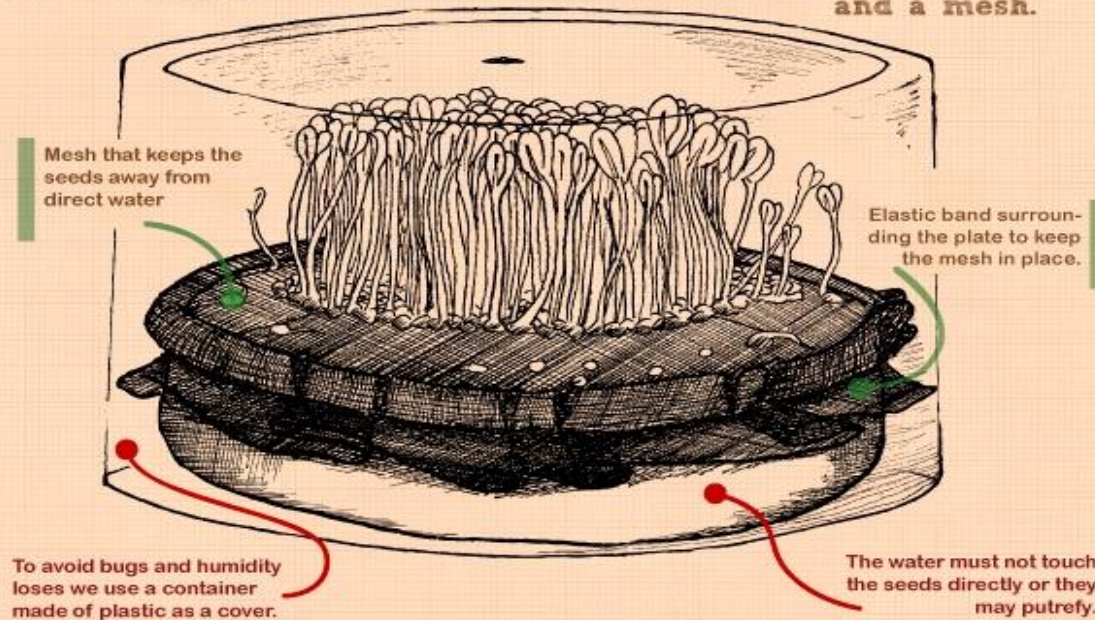
- Sprouting seeds quickly grows greens with no soil involved – great for fresh food in the wintertime
- The sprouts have different nutritive values compared to their seeds
- Fill a jar 1/3 full and soak the seeds with water; cover with a single layer of cheesecloth or some other membrane and pour out water – repeat every 4 hours for 1 day: takes 3 – 5 days to grow in a moist environment



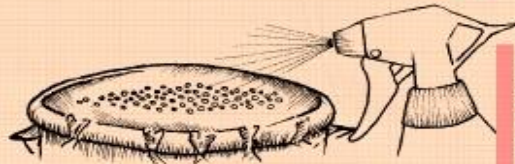
Germinators ^{Victor Paiam} DIY Mucilaginous

Your chia and other seeds now more nutritive.

With a deep plate and a mesh.



Soak the seeds, only 1 hour or 2, we will use this water later to fill the germinator.



Extend the seeds on the mesh and humidify them with a spray once in a while.

The mucilaginous seeds segregates a substance that keeps the humidity in a natural way.

Some common mucilaginous seeds to germinate.



Chia
Harvest: 5 - 6 d.
High Omega 3 content, multnutritious.



Arugula
Harvest: 5 - 7 d.
A and C vitamins, Strengthens the immune system.



Mustard
Harvest: 7 - 9 d.
Hot, Normalizes the inflammations, regulates the digestive system.



Basil
Harvest: 5 - 7 d.
Soft flavour. Vitamins A y B1, Very energetic.

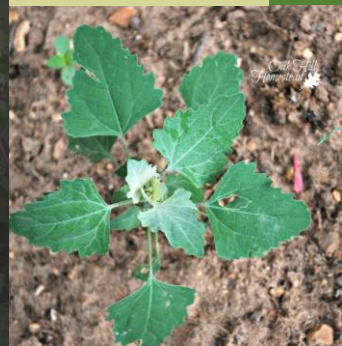


Flax
Harvest: 5 - 6 d.
Very digestible, vitamin C and proteins.



Foraging Crops

- This is for the worst of the worst case scenarios... or if just interested, and involves a bag of basic bird seed and garden weeds; this is a thought experiment on how one can forage food in tough situations
- Bird seed (on the cheaper end) consists of white millet, red millet, wheat, sorghum, flax, sunflower, and sometimes whole corn; separate all the seeds and store in bags; These are unshelled and usable in the garden, as sprouts, and for cooking
- The wheat and millet are cereal grains fit for human consumption (millet very popular in eastern cuisine); sorghum is a grain with high concentrations of protein; the sunflower seeds are good for pressing fats and low amounts of protein; the corn is a livestock feed variety called “dented corn” and not good for human consumption, but works for feeding any feral birds caught; flax seed (if blue flax) works for growing linen and eating the excess seeds
- Along with grains and fats, many plants we consider and treat as pests are good for consumption in a pinch; dandelions, lamb’s quarters, and rose hips being the most useful and flavorful
- Imagination is your best tool



Edible Flowers

•Edible flowers are mostly decorative, used as garnish; rose hips for juicing and preserving as a vitamin C supplement in the winter

•Examples are roses, black hollyhock, pink mallow, vegetable and herb flowers

•Edible flowers do not have much nutritive value, but some are medicinal like passion flower



White Mallow
(malvaceae alcea)



Nasturtium
(tropaeolum majus)



Oregano
(origanum vulgare)



Oxalis
(oxalis oregana)



Oxe-eye Daisy
(chrysanthemum
leucanthemum)



Sugar Snap Pea
(leguminosae spp.)



Primrose, Evening
(Oenothera spp.)



Pink Rose
(rosa rugosa)



White Rose
(rosa spp.)



Sage bergamot
(salvia officinalis)



Squash Blossom
(cucurbitaceae spp.)



St. John's Wort
(hypericum formosum)



Sweet Rocket
(hesperis matronalis)



Thistle
(cirsium arvense)



Violet
(viola spp.)

Edible Flowers

50 Count (some exceptions)



Flower
Angelica Blossom
Available January - August
100 Count



Flower
Basil Blossom
Available Year Round



Flower
Bachelor Buttons
Available March - August



Flower
Borage Blossom
Available March - August
100 Count



Flower
Buzz Button
Available Year Round
30 Count



Flower
Calendula
Available August - May



Flower
Camellia
Available March - April
25 Count



Flower
Chives Blossom
Available May - August



Flower
Dahlia
Available March - August



Flower
FireStix
Available Year Round
100 Count



Flower
FireStix Mix
Available Year Round
100 Count



Flower
Garlic Flowers
Available March - August



Flower
Lavender
Available Year Round except
December & January



Flower
Marigold
Available Year Round except
December & January



Flower
Nasturtium
Available Year Round



Flower
Orchid
Available Year Round



Flower
Pansy
Available Year Round except
June & July



Flower
Snapdragon
Available August - May



Flower
Sparklers
Available Year Round



Flower
Sparkler Tops
Available Year Round



Flower
Viola
Available Year Round
except June & July



Premium
Confetti Mix
Available Year Round
100 Count



Premium
Confetti Mix
Available Year Round
4 oz



Flower
Herb Mix
Available Year Round

Latex Plants and Production

- Utah's history with latex farming was brief in the second half of WWII to work through the rubber shortage by growing dryland shrubs called guayule; after VJ day, the need for domestic farming ended abruptly
- Growing guayule in West Valley's soils could work with sparse watering and modified fertility, though the yield is low compared to tropical trees and processing is more laborious; the shrubs are chopped down completely, trimmed of leaves, wood branches and trunk are processed similar to sugar beets; guayule latex is also hypoallergenic compared to its tropical counterpart
- Worse comes to worse we'd be better off recycling synthetic rubber than growing new batches; though, it's always good to know there's an alternative if needed



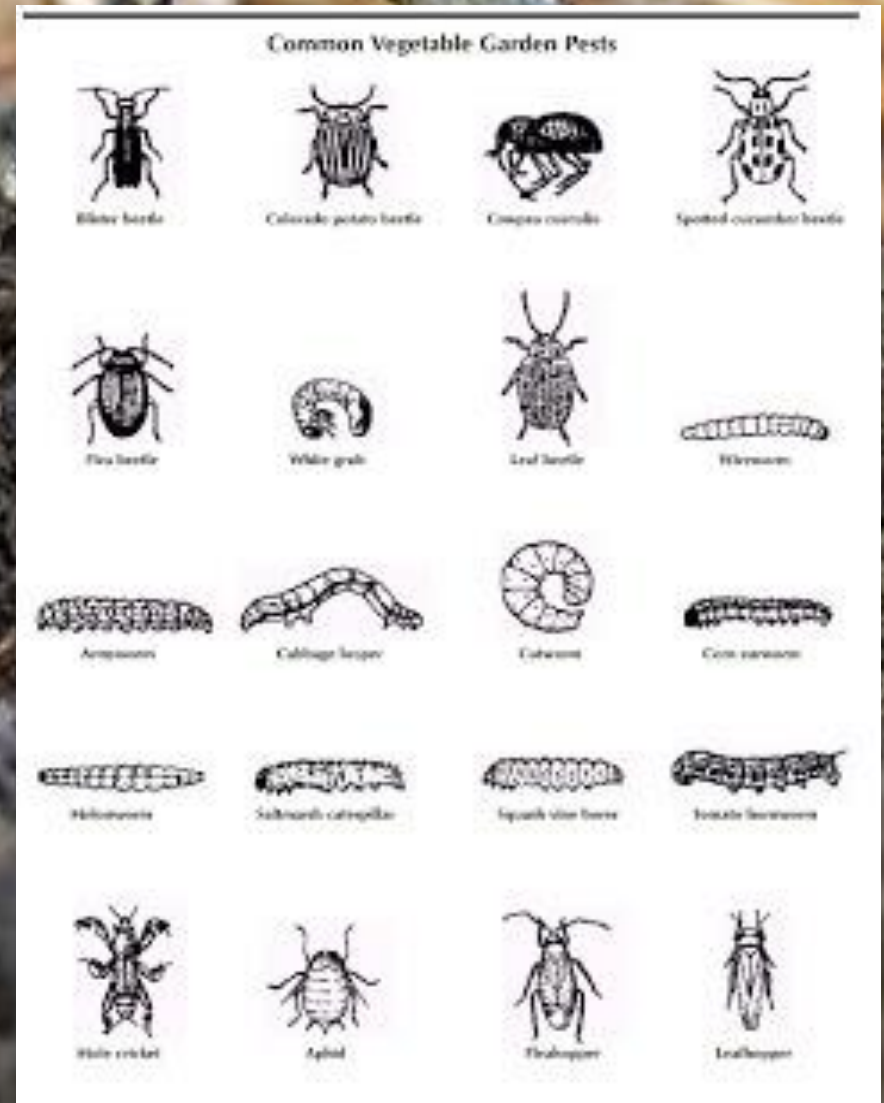
Garden Management

.Consistency with a garden is the second key to success

.Pests and disease are always seeking an easy score – be vigilant

.A method of handling garden wastes is necessary for provident living; waste not, want not

.If composting is a concern or something you don't want to deal with; burying wastes one foot in the soil is a good, quick method



Composting

- Composting is a great way to save money and soil nutrients
- Garden scraps, kitchen scraps, and some forms of trash are recycled into a nutritious mulch for the garden
- Do not use any foods containing fats, grease, yeast (or yeast raised), or anything with high salt or preservatives
- Do not use compost in hydroponic systems as it will clog pumps and pipes, and is inconsistent in quality - upsets nutrient balances

The Compost List

Items Not for Composting

- Cooked waste that may become moldy
- Left-over meat, cheese, gravy, butter, frying fats & moldy bread
- Citrus fruit skins that have been chemically treated
- Potato peels
- Oil
- Fish & bones
- Wet grass
- Old plants
- Ashes of coals and briquettes

Items for Composting

- Vegetable waste
- Fruit waste
- Freezer-burned fruit, vegetables
- Old spices, dried-up herbs
- Potato peelings
- Stale bread
- Stale potato chips
- Nut shells
- Watermelon rinds
- Egg shells
- Coffee, filters & teabags
- Cooked rice
- Paper napkins & paper towels
- Seedless weeds
- Leaves
- Grass clippings
- Wood chips, saw dust
- Shredded papers
- Houseplant trimmings
- Lint from refrigerator or dryer
- Pet hair
- Vacuum cleaner bag contents

How to make: Compost

Compost is made by adding layers of different organic materials in a heap. As it rots, the heap becomes compost. There are many different ways to make compost. This is just one way.

A tree gives shelter and shade

Why use compost?
Compost is a free organic fertilizer. It improves soil structure and helps soil to hold water. Compost increases yields.

Ready In
6+ Weeks

① Dry plant material gives soil carbon and improves soil structure

② Sprinkle Water to help the heap to rot

③ Animal droppings from cows, chickens, goats, pigs or rabbits adds nutrients

A cover protects and keeps the compost moist

Use a Temperature Stick to check that the heap is rotting.

⑥ Sprinkle Ash for potassium and Water to help the heap to rot

⑤ Green plant material adds nutrients

④ Top soil for insects and worms

Dig a pit and make a bed for the compost with twigs or stalks

Step by Step



Make the Base

- Find a shady area
- Dig a pit for the compost
- Make a bed with twigs or stalks



Heap the layers

- Chop the materials and heap the layers.
- Repeat the layers 3 or 4 times
- Cover with soil and dry grass

1. Dry plant material
2. Water
3. Animal Droppings
4. Top soil
5. Green plant material
6. Ash and Water



Turn the heap

- After 3 weeks turn the heap layer by layer. This helps the compost to rot.
- After another 3 weeks it will be ready.



Apply to crops

- When the heap is brown and lumpy it is ready.
- Dig a ditch around crops, add compost and cover.

"Using compost means my crops grow faster, healthier, and give a high yield."
Joyce, Kyenjojo



Weeding

•Weeds are any plants growing in an undesirable location; most are native or invasive plants (Invasive plants are non-native species that have no local predators); weeding removes competition of nutrients and ensures space for crops

•Best to use a pre-emergent herbicide to reduce weeds

•Do not allow weeds to go to seed: one year of germinated weeds is seven years of weeding

•Use a garden hoe, stirrup hoe, herbicides, or blowtorch; if possible, remove with the root system

•Start with weeding by hand, followed by hoeing, and ending with stirrup hoeing while backing out; Weed the same area every 3 days



Saving Seeds

- Plants that are labeled “hybrid” might not be able to produce sustainable offspring – it's the nature of the plant
- To save seeds, grow plants labeled “heirloom”
- Good rule of thumb is allow 1 of every 30 plants with excellent attributes to go to seed
- Collect by allowing seed heads to mature and dry; for squash and melons, clean seeds and air dry – store in a dark, cold, dry place



Characteristics of Quality Seed

- High germination rate.
- True to type. Few or no off-types.
- Pest free.
- Uniform size.



Seed Saving Tips

Grow your favorite plants again, save money, trade seed and preserve plant diversity.

Beans	Let the pods age on the vine until they turn brown. You can also store the entire plant (with roots) upside down in a warm area until pods dry out. Cross-pollination could affect the purity of your bean seeds in the future. Pole beans are more likely to cross.
Cantaloupe	Best time to collect seed is when the stem dies and the fruit separates easily. Remove the membranes from the seed by rinsing and gently rubbing with your fingers.
Cucumber	Harvest seed when cucumbers are fully ripe and yellowed (too ripe for eating).
Lettuce	Let seed pods dry on the plant. Bag the plant to capture the seeds because they progressively fall off from bottom to top. Do not save seed from plants that bolt too soon. The seed you save may produce plants that go to seed prematurely.
Peas	Wait until the plant dies and collect the seeds. Peas do not cross-pollinate.
Peppers	Best time to collect seed is when peppers are full color and beginning to shrivel. Brush off the seeds from the inside stem and let dry. Peppers of the same species could cross. Grow one hot type and one sweet type to prevent cross-pollination.
Pumpkin	Remove seeds three weeks after harvesting the pumpkin. Varieties within the same species can cross. Rinse off membranes and dry well.
Squash (Summer)	Harvest seed when the squash has a hard skin and is too ripe to eat. Hold the seeds under water and rinse off the membrane. Avoid cross-pollination-do not plant these species together: Cucurbita Pepo, Cucurbita Moschata, Cucurbita Maxima and Cucurbita Mixta.
Sunflower	Most sunflowers are hybrids. Save heirloom seeds if you want the flower to stay true. Hang flower heads upside down by a short length of stalk in a cool, dry spot. Once dry, remove the seeds and keep dry until planting.
Tomato	Save seed when fruit is full color and firm, but still tender to the touch. Remove the protective gel covering the seed. Cross-pollination may occur with wild or currant tomatoes but most popular types will not cross. Ensure space between plants.
Watermelon	Remove fibers and membranes by rinsing. When dropped in a glass of water, viable seeds will sink to the bottom. Seeds that float may not germinate well.

The table to the left lists several popular annual vegetables and fruits with easy-to-save seeds and a lower potential for cross-pollination in the home garden. They flower and mature seed in the same year. General advice is given to maintain as much seed purity as possible when plants are more prone to cross.

Please seek out other references to enhance your knowledge of seed saving.

Seed Saving Basics

- ~Save seeds from **heirloom** or **open pollinated (OP)** plants only if you want them to stay true. Hybrid seed will not produce the same plant again.
- ~Choose the healthiest plants and the largest seeds.
- ~Air dry seeds on a fine screen or paper away from direct sunlight and as quickly as possible to reduce contamination.
- ~Label seed (drying and storage).
- ~Use containers that limit moisture.
- ~Drying may not be necessary if planting soon after collection.

Plant Diseases

- Diseases are inevitable - most can be prevented and treated

- Most diseases are caused by buildup in soils, nutrient deficiencies, or pest transmission; aphids will always lead to fungal infections

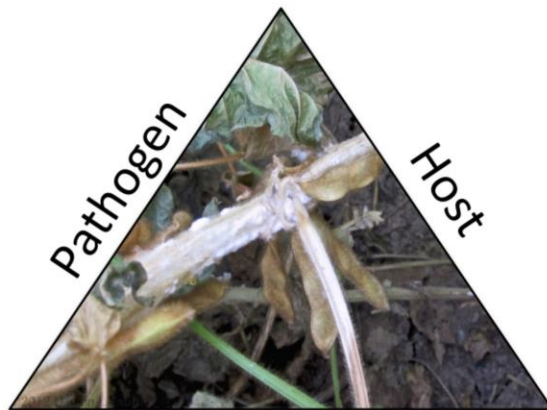
- You'll use mostly antifungals than antibacterial treatments

- A good, old fashioned fungicide (mostly for treating potato blight and fruit tree leaf curl) is Bordeaux Mixture: mix 100 grams copper sulfate and 100 grams hydrated lime in separate non-metallic containers with 5 liters water each, slowly add the lime to the copper, mix together gently and pour into a sprayer; be sure to spray under the leaves and above; shake the sprayer here and there to remix contents; wash off any spray that gets on turf with clean water

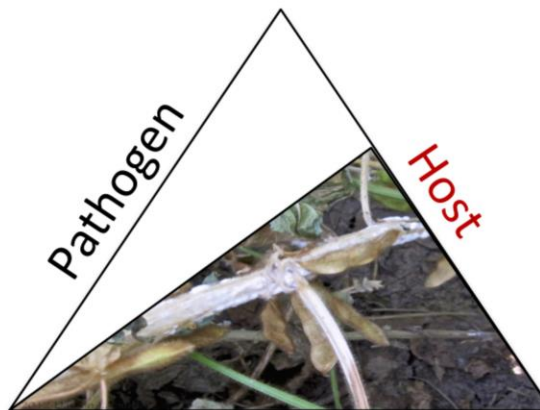
- If all else fails – steam sanitize the soil



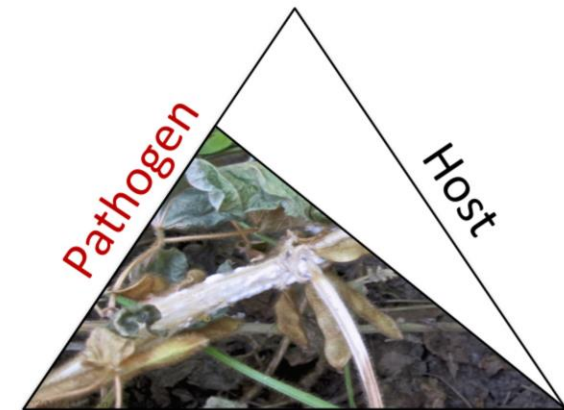
PLANT DISEASE TRIANGLE



Environment

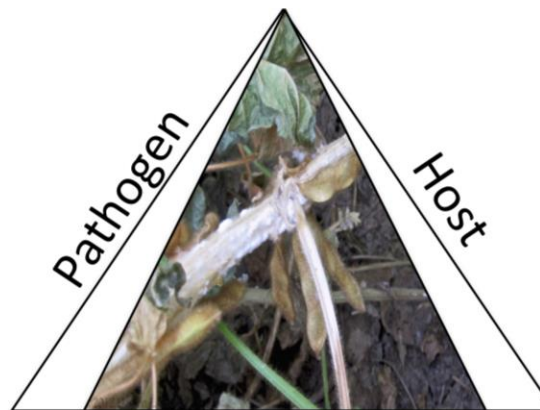


Environment



Environment

- Disease only occurs if three things exist all at the same time
 - Pathogen
 - Host
 - Environment
- Manipulating a component or combinations of triangle components influences the incidence and severity of disease



Environment



Environment



U-scout Plant Pathology Lab, NFREC

CUCURBIT DISEASES



[Subscribe](#)



Alternaria leaf spot
3 photos



Anthracnose
4 photos



Rhizoctonia root rot
4 photos



Cercospora leaf spot
7 photos



Gummy stem blight
24 photos



Powdery mildew
7 photos



Southern blight
5 photos



Downy mildew
12 photos



Cucurbit Leaf Crumple Virus
6 photos



Potyvirus
14 photos



Watermelon rind necrosis
4 photos



Blossom end rot
3 photos

Pest Control

.Aphids are the most common pests to infect a garden; spray your fruit trees every year to avoid losses

.Other pests are yellow-jackets, mealy bugs, mice, rats, and birds

.Use companion planting where possible to discourage pests

.Bird netting and shiny metal will keep away most birds; set mice and rat traps regardless of what is being grown – they will go for all of it

.Use pesticides and traps with care and skill

.Make sure what's in your garden IS a pest before dealing with it – there are helpful animals lurking in the garden as well; there are targeted pesticides and recommend using them before considering an all encompassing pesticide (such as Seven/5)



Helpful Animals

- With plenty of pests there's usually their predators nearby
- Some pesticides (like Seven/5) are harmful for both pests and beneficial animals; be careful with what's used
- Garter Snakes, toads and frogs, spiders, earwigs, ladybugs, praying mantis, pill bugs, and lacewing flies are helpful in controlling pests and protecting the garden

















BENEFICIAL INSECT IPM CHART

BENEFICIAL INSECT

-  Effective Control
-  Partially Effective Control
-  Will Eat Anything It Can Find
-  Bacteria

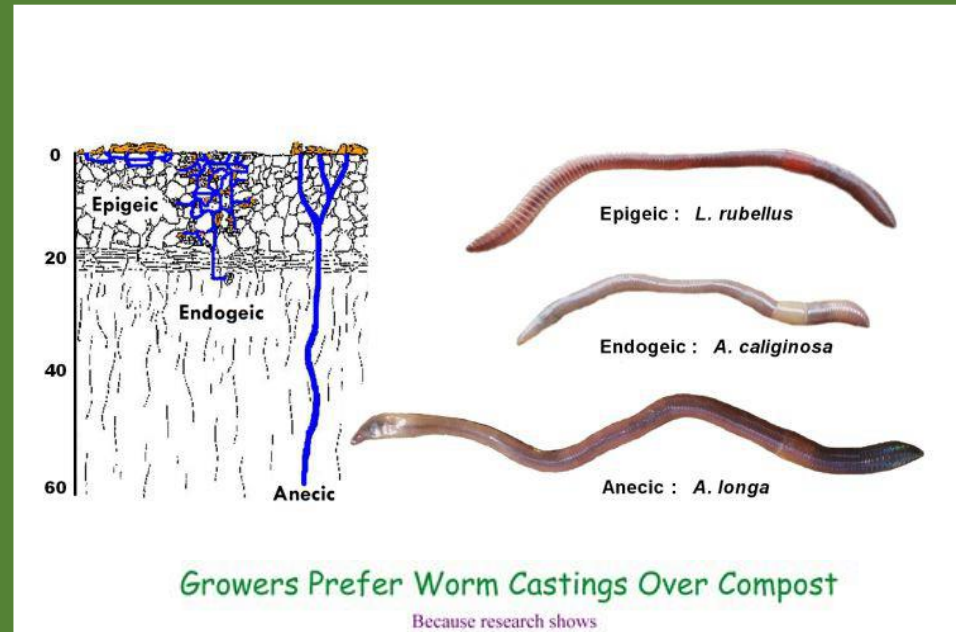
HARMFUL INSECT



	Spider Mites	Flat Mites	Aphids	Thrips	White Flies	Fungus Gnats	Gnat Larvae	Mealy Bugs	Scales	Beetles	Caterpillars
 LadyBug (<i>Hippodamia convergens</i>)	Effective Control		Effective Control	Effective Control	Effective Control			Partially Effective Control	Effective Control		
 Pirate Bug (<i>Orius insidiosus</i>)	Effective Control		Effective Control	Effective Control	Effective Control			Partially Effective Control	Effective Control		
 Praying Mantis (<i>Tenodera sinensis</i>)	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find	Will Eat Anything It Can Find
 Green Lacewing (<i>Chrysopa rufilabris</i>)			Effective Control	Effective Control	Effective Control			Partially Effective Control	Effective Control		
 Spider Mite Predators (<i>Phytoseiulus persimilis</i> , <i>Neoseiulus californicus</i> , <i>Mesoseiulus longipes</i>)	Effective Control										
 Spider Mite Destroyers (<i>Stethorus punctillum</i>)	Effective Control										
 WhiteFly Parasite (<i>Encarsia formosa</i>)					Effective Control						
 Aphid Predators (<i>Aphidoletes aphidimyza</i>)		Effective Control									
 Aphid Parasites (<i>Aphidoletes matricariae</i>)		Effective Control									
 Predatory Nematodes				Effective Control		Effective Control	Effective Control				Effective Control
 Thrip Predator Mites (<i>Amblyseius cucumeris</i>)	Effective Control			Effective Control							
 Fungus Gnat Predators (<i>Hypoaspis</i>)	Effective Control			Partially Effective Control		Effective Control	Effective Control				
 MealyBug Destroyer (<i>Cryptolaemus montrouzieri</i>)			Effective Control					Effective Control	Effective Control		
 ★ Spinosad (<i>Saccharopolyspora spinosa</i>)	Partially Effective Control		Effective Control							Effective Control	Effective Control
★ <i>Bacillus thuringiensis</i>						Effective Control	Effective Control				

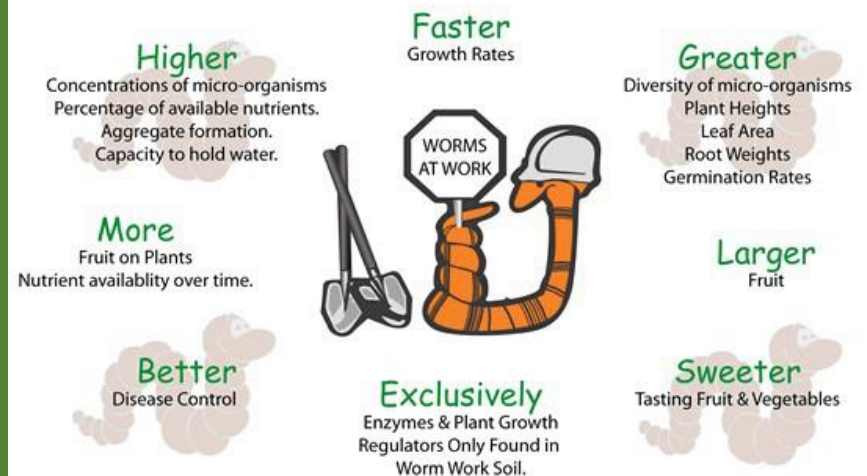
Earthworms

- Earthworms digest biological material in the soil, creates channels for soil aeration, and fertilizes through excrement via skin excretion called “worm casings”
- Worms take care of their own needs without the gardener to encourage them
- Night Crawlers, a great fishing bait, thrive on rabbit manure



Growers Prefer Worm Castings Over Compost

Because research shows
Worm Castings Produce Superior Results



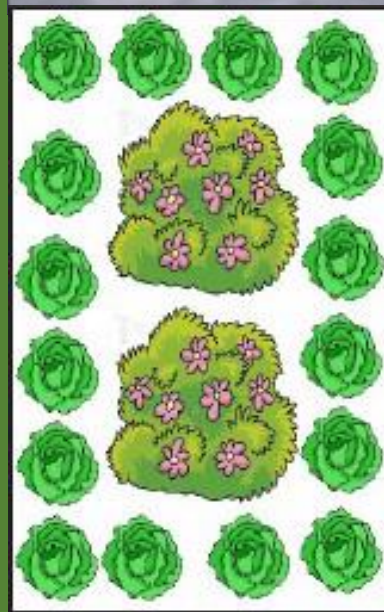
Snails

•Snails and Slugs are terrible pests in the backyard garden; snails, however, are not insects; they are inland shellfish, and... are edible

•Collect large snails from the garden and place in a quart jar with large holes drilled in the lid (small holes will become clogged with their mucus and they will suffocate), place a carrot sticks inside for food; pour water through the holes and dump out to water them; when their feces turn orange, rinse the snails and place in simmering water to cook thoroughly for a few minutes, remove shells, and consume

•A snail garden sequesters, cleanses, and breeds them best for eating; a 12' X 4' screen covered box with non-edible leafy plants in the middle surrounded by edible plants, or edible plants in the middle with some lean-to boards for shelter; move captured adults snails or go through your garden soil looking for snail eggs for transplanting by burying and lightly compacting soil around them

•Good source of trace vitamins and minerals - especially iodine; has a mild flavor similar to oysters and absorbs other flavors well



Discouraging Wild Birds

•Birds can become a nuisance;
best not to encourage nesting near
your food garden

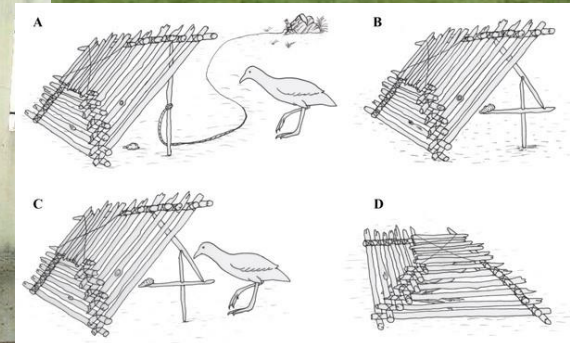
•Netting over plants is a good way
to discourage birds from eating
your garden; elevate the netting
far enough away from fruits and
leaves using sticks or wire

•Placing a bird feeder on the
opposite side of the yard
encourages the birds to feed there;
with full bellies they're less likely
to feed on your garden



Trapping Edible Birds

- Being in an urban area, hunting and trapping is restricted under State Code 23-13-02; however, under 23-13-02-50 the definition of trapping is taking protected wildlife with a trapping device; and under 23-13-02-54(a-c) the definition of Wildlife is (a) crustaceans, including brine shrimp and crayfish (b) mollusks (c) vertebrate animals living in nature, except feral animals
- Rock pigeons and California quails are considered feral animals by the department of agriculture, while Banded-Neck doves are considered invasive; none are on any endangered lists, but there can be arguments against trapping them – so be cautious
- Use a cage trap or arapuca-style trap; very efficient
- Do not immediately consume due to pathogens and parasites; place the freshly caught birds in a pen with medicated water for internal parasites and disease (available at IFA and CAL Ranch), and a dry bath of fine fireplace ashes for external parasites; harvest in a week or keep in a separate coop for breeding



Hydroponic Gardening

- Hydroponics grows plants in either gel or a growing medium with periodic washes of nutrient-dense water – no soil is used
- Crops grow much faster and have less of an earthy flavor
- Outdoor systems are fine, but much easier to grow under protective covers or sealed greenhouses
- Expensive one-time equipment costs compared to soil gardens, but will return 7 – 18 times more produce in the same growing season as traditional methods
- For the Saints in Zion this method increases food production at home to self-sustaining levels - an answer to earlier concerns about our small garden areas; this method frees up vegetable plots to grow grains, tubers, livestock, and fibers



How Hydroponics Works

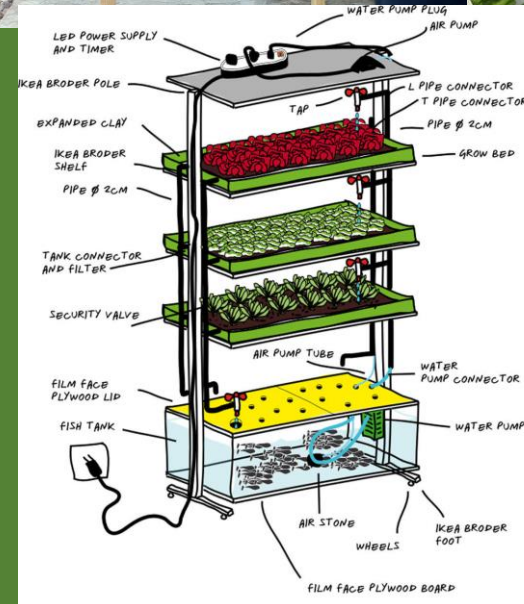
• Hydroponics relies on no natural soil or potting soil; but consists of two necessities – a growing medium and nutrient-enriched water

• Water should be contaminant free – chlorine and other contaminants normally filtered out in garden soil is heavily absorbed in hydroponics and will poison plants; rainwater is optimal

• With pumps and gravity, a water flow cycle is created; some systems work on floating rafts with a slow-flowing pond providing water and nutrients, some rely on flooding or a small trickling stream, while more advanced systems rely on vaporized water and nutrients

• Nutrient Film Techniques require a slope of 30:1 to 40:1 (every 30 inches allow for a 1 inch drop) to ensure the water is moving at an optimal pace

• Do your research on what system works for your situation and the space available



Hydroponic Systems

Pros

Cons

Simple

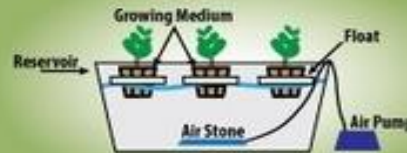
Wick Systems:



- Affordable
- Low maintenance
- No nutrient pump

- Limited oxygen access
- Slower growth rate
- No nutrient recirculation
- Prone to algae growth

Deep Water Culture:



- Cheapest of the active systems
- Simple set up
- No nutrient pump
- Reliable

- Risk of root rot if not cleaned regularly
- Slower growth rate
- Must top water until roots are long enough to fall into the nutrition solution
- Must frequently refill reservoir

Ebb & Flow:



- Affordable
- Low maintenance
- Excess nutrient solution recirculates

- Prone to algae growth
- Technical malfunctions could result in crop loss

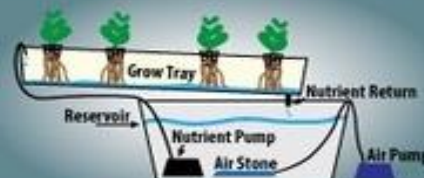
Drip Method:



- Excess nutrient solution recirculates
- Sufficient oxygen flow

- Prone to clogging
- Prone to algae growth
- Requires regular cleaning

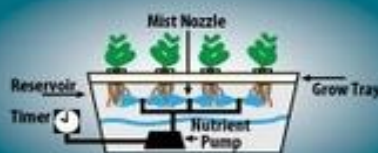
Nutrient-Film Technique:



- Excess nutrient solution recirculates
- Plentiful oxygen flow
- Space efficient

- Prone to clogging
- Technical malfunctions could result in crop loss

Aeroponics:

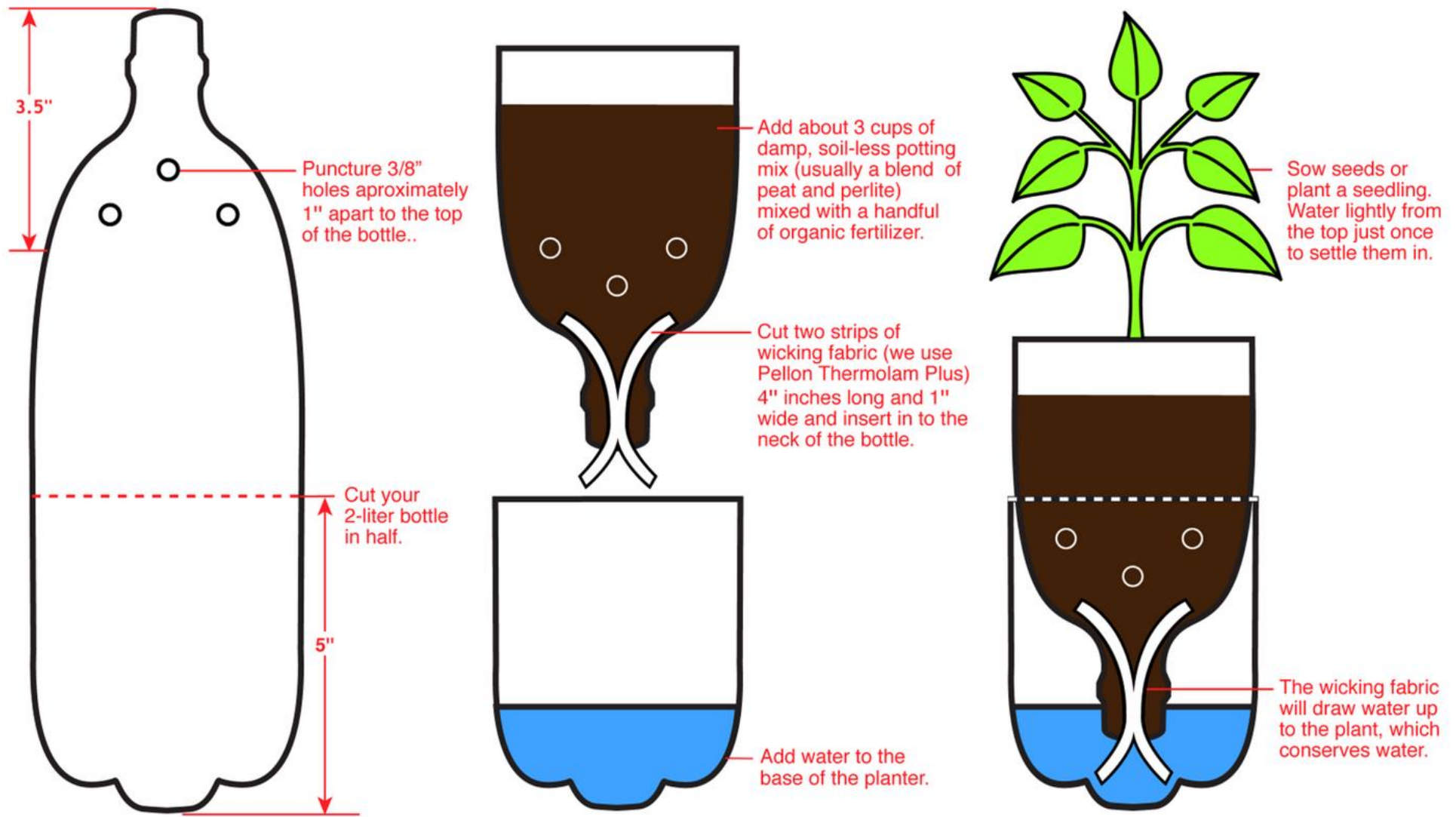


- Maximum nutrient absorption
- Excess nutrient solution recirculates
- Plentiful oxygen flow
- Space efficient

- Prone to clogging
- Technical malfunctions could result in crop loss
- High-tech
- Time intensive
- Poorly suited to thick organic-based nutrients & additives

Advanced

How to make a 2-Liter SIP (sub-irrigated planter)



Aeroponic Gardening

- Aeroponics is a new farming system for inner city landscapes
- Utilizes a series of shelves with grow lights on each level; seeds are sown into a membrane and nourished by a mist of water with liquid fertilizer
- Plants are grown in beds or vertically to conserve space; the entire system is computer controlled
- Still in the experimental stages; a similar set up is possible in the home; use greenhouse plant varieties only
- Very expensive initial costs compared to hydroponics and aquaponics; but the returns are very high and possibly cheaper than hydroponics in the long term



News

GROWING UP

A local inventor has come up with a way, in land-scarce S'pore, to increase the supply of leafy vegetables. Infographics journalist FADZIL HAMZAH shows you how

YOU could call it a veggie-go-round. And it is the brainchild of local inventor Jack Ng, 48, of privately owned DJ Engineering.

With the help of the Agri-Food and Veterinary Authority (AVA), he has come up with a solution to make vegetable farming yield five times more produce than it normally can with the same amount of land.

He has done this with minimal resources by coming up with vertical contraptions known as tower farms.

The six metre-tall structures are energy-efficient as they are easy and cheap to maintain.

The tower uses only 1kW of electricity per hour for its water pump which distributes 1kg of water to rotate 22 racks.

It costs \$10,000 to set up one tower.

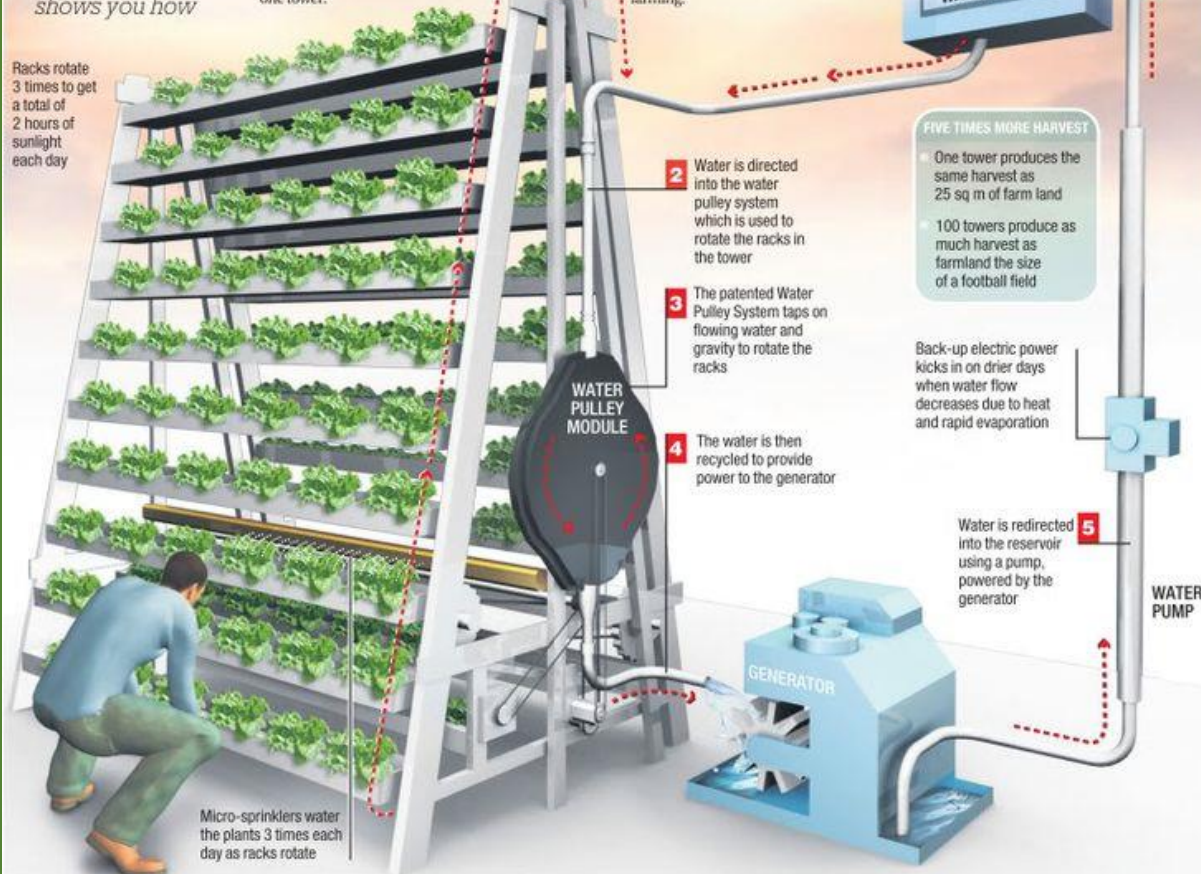
The prototype farm, which consists of 19 towers, occupies 1,000 sq m of land at Sembawang Research Centre.

National Development Minister Mah Bow Tan, who visited the farm at its launch on Jan 28, was pleased at the prospect of spreading the idea to all the local vegetable farms.

"Farming leafy vegetables tends to be very land-intensive so innovative systems like this can improve the productivity of local farms," Mr Mah said.

Mr Ng has started a company called Sky Greens. The \$1 million project aims to produce vegetables on a commercial scale by year-end and to market vertical farming.

Racks rotate 3 times to get a total of 2 hours of sunlight each day



These 30-day crops are harvested daily. According to feedback from restaurants & supermarkets (which tested samples), they are 'crunchier' than regular vegetables



Chinese cabbage



Xiao bai cai



Kai Lan



lettuce



"Food prices were going up because of supply disruptions overseas, so I had the idea of growing more food here."

—Mr Jack Ng (left), who took two years to develop his idea

SOURCE: AGRI-FOOD & VETERINARY AUTHORITY OF SINGAPORE

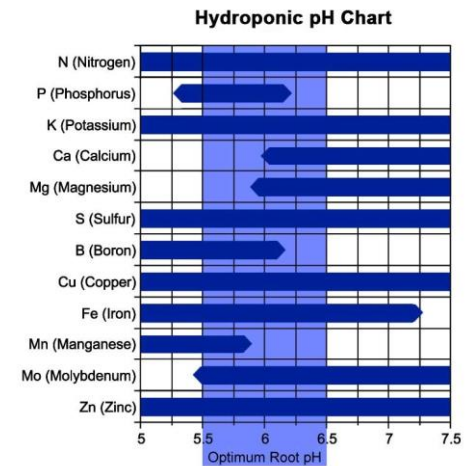
Growing Medium

- Growing Mediums are inert, chemically inactive materials that give the plant roots stability and grip
- Growing medium types are numerous: Rockwool, oasis cubes, and playground sand are best to start seedlings; perlite, expanded clay, gravel, and such are good for seedlings and transplants; Styrofoam floats are best for transplants in shallow bed methods; packing peanuts are best for transplants only
- After harvesting is finished the medium is either changed completely or sanitized; Styrofoam floats are set in bleach for several minutes and left to dry; any stone based mediums are best baked in an oven for 1 hour per inch depth; Rockwool and oasis cubes mostly dissolve and are not a concern; wood-based and packing peanuts are discarded



Pumps, Aeration, and pH Balance

- Water pumps are the literal heart of your system; be sure to purchase a pump that can handle how much water you plan to pump vertically; if doing an ebb & flow system buy a timer for your pump; for NFT systems a normal aquarium pump works well; for aeroponic systems research atomizing pumps carefully
- Along with water flow, add an aerator to provide oxygen to your system; without oxygen, plants will grow slow and small
- In traditional gardening acidic soil traps nutrients and starves your plants until lime treatments take effect; in hydroponics, acidic water will quickly choke off your crops and kill the entire system; test your water daily for pH; numbers should be between 6.5 – 7.0; use a meter or test strips; add appropriate chemicals as needed
- The loss of a pump or aerator from a breakdown can mean loss of entire crops in a matter of hours; always have backups of all equipment



Lighting, Temperature, and Air Flow

- Commercial grow lights, LED's, and “daylight's” are fine for confined spaces where light is concentrated and for crops that need less light; for a large area with one or two flood lights use Metal Halide bulbs (requires a special ballast, uses more energy than normal room lighting, but the results for your crops are excellent)
- Optimal temperature for hydroponics is between 65° - 78°F – same as normal human comfort; a small heater and air conditioner may be needed depending on the system's location
- Plants in nature strengthen their stalks in response to wind; without this the plant's stalks become weak and unable to bear much fruit; provide simple fans to encourage strong growth



Nutrients

- Hydroponics relies solely on water soluble fertilizers
- There are many recipes for general nutrient baths and plant specific nutrient solutions; be careful which one(s) you choose: if you choose to go nutrient specific, this will mean individual systems for each kind of crop (if growing 14 different kinds of fruits and vegetables, this means 14 completely separate hydroponic systems)
- Mixing your own recipes is a tricky endeavor: very rewarding if done right – disastrous if slightly off-balance; commercial bottles have measurement charts to assist
- Best to use a general fertilizer if you're a beginner, or planning to move towards an aquaponic system
- Start by adjusting the water's pH, then take your PPM (parts per million) measurement, and add nutrients based on PPM results; measure how much calcium, iron, etc. is present in the water; use the charts on the bottles to add the correct amount within tolerance; too much or too little fertilizer won't help anything



What to Grow Hydroponically

• So long as the right nutrients are added for the right plants; any crop can be grown hydroponically – even fruit trees

• Fruit trees need staking, gourds and melons need netting, and all vertical plants need supports

• Also important to grow plants in the way that is optimal for harvests: for example, grow strawberries elevated so the berries droop over and under – allows the leaves to get the most light and makes harvesting bigger berries easier

• Varieties that benefit most from growing hydroponically in Utah are delicate tropicals like banana, papaya, cocoa bean, etc.



Crop Varieties Best Suited for Hydroponics

(All varieties of plants work – every single kind; these work especially well for this system)

Lettuce

- Bibb: Decimor, Ostinata, Cortina, Rex, Salina, Milou, Vegas
- Loose Leaf: Domineer, Black Seeded Simpson, Grand Rapids, Waldmann's Dark Green
- Head: Great Lake's 659, Montemar
- Romaine: Valmaine Cos, Cimmarron, Parris Island Cos

Tomatoes

- Beefsteak: Dombito, Caruso, Larma, Perfecto, Belmondo, Trend, Trust, Apollo, Match, Blitz, Quest, Laura
- Cherry: Favorita, Conchita
- Tomatoes-on-the-Vine: Tradiro, Ambiance, Balance, Cronos
- Roma

Cucumbers

Varieties: Toska 70, Pandex, Uniflora D, Corona, Farona, Marillo, Fidelio, Bronco, Mustang, Exacta, Ventura 1289, Jessica, Optima, Flamingo, Dominica, Accolade, Discover, Milligon

Carrots

A+Hybrid, Minicore, Scarlet Nantes, Sweetness

Bell Peppers

Red: Delphin, Plutoma, Tango, Cubico, Mazurka, Val Valeta

Yellow: Luteus, Goldstar, Samantha, Gold Flame, Kelvin

Orange: Wonder, Eagle, Nairobi, Fellini

Purple: Violetta

Others

- Herbs: Basil, Oregano, Thyme, Mint
- Watercress
- Strawberries
- Raspberries
- Tropical Fruit Trees: Dwarf Banana, Mandarin Orange, Dwarf Lemon, Dwarf Lime
- Grains, Legume Hay, and Grasses
- Root crops

Transplanting Hydroponics

- Transplanting into a hydroponic system is different from normal soil transplanting
- If transplants are from a soil medium: gently rinse all soil from the roots of the plant and place shallowly in growing medium – if using a heavy medium, such as gravel or expanded clay, then be gentle to avoid crushing the plant or roots
- If transplanting from Rockwool or oasis cube: leave the plant in the pellet and move it directly into a growing medium, careful not to crush the plant



Livestock Fodder

- If feeding a homegrown diet to your livestock, eventually you'll grow or buy a lot of hay and grass to feed them over winter; growing your own fodder with this system spares the lawn from becoming a pasture, and your budget from feed costs
- The system consists of shallow trays filled 1-2 layers deep, side-by-side, with any grain or legume hay seed; sprout these seeds by dousing them in nutrient solution until it covers the seeds, repeat as needed; for lighting, fodder doesn't need metal halide - strings of bright LED's works great
- The seeds will sprout roots and entangle each other to form a thick matting while leaves and stalks grow normally; harvest after 3 weeks and immediately feed to the livestock
- This system will not grow suitable seed heads for cereals / flour as the grain's berries lack enough proteins for nutrition; if wanting to grow grains it's best done outside in the soil



Hydroponic Root Crops

- Growing root crops are a newer addition to hydroponics as these types of vegetables traditionally required soil coverings; this is more of a novelty so if growing enough to feed a family do it outside in the soil
- Plants like onions and beets only need the roots exposed to nutrient solutions, while potatoes and carrots need the entire root covered; potatoes especially as the new tubers grow on top of the seed, best to grow in perlite or sand, adding more as the potato vine grows up



Plant Cloning

- Plant cloning is not so controversial as animal or human cloning as this method uses the plants' natural growth abilities rather than splicing in a host nucleus to a donor ovum
- Useful when crop uniformity is desired; no worries about seeds not sprouting or new plants producing less
- Whole cells are removed from the alpha plant and placed into an agar gel solution, and then into an incubator with red/blue spectrum grow lights and humidity controls
- Plant agar gel contains cytokinins and auxins hormones that encourage the cells to develop root systems and grow leaves; the gel also contains sucrose, glucose, carbohydrates, B vitamins and other nutrients; this is different than laboratory agar
- Not a permanent solution; do not re-clone plants more than 3 times

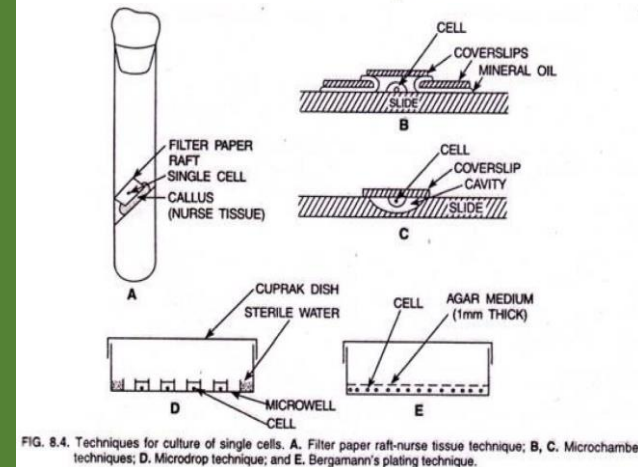
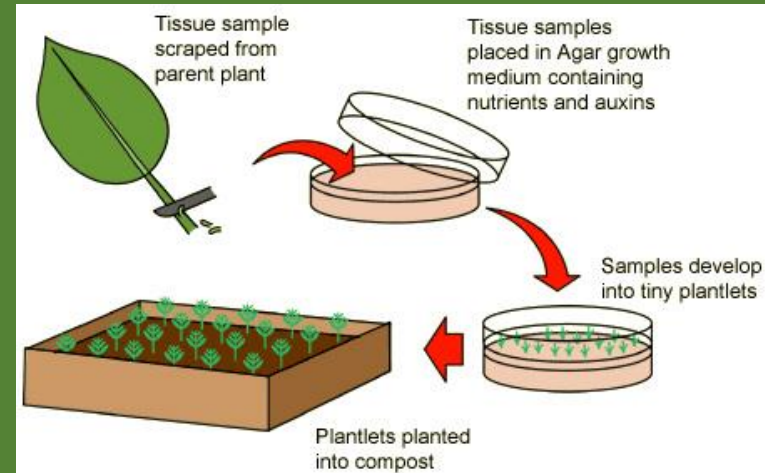
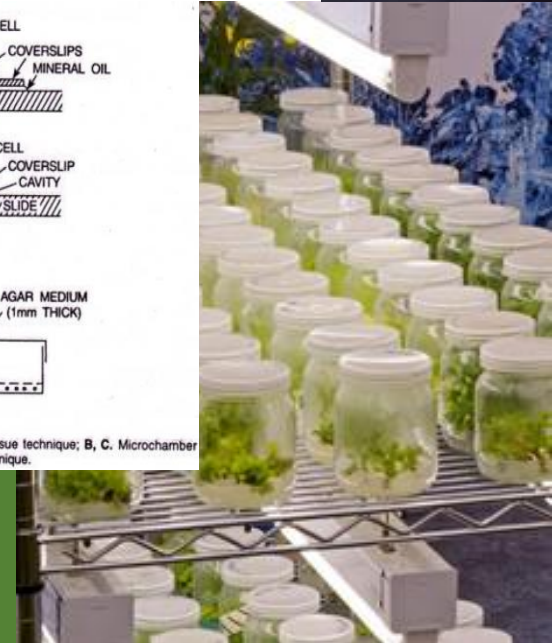


FIG. 8.4. Techniques for culture of single cells. A. Filter paper raft-nurse tissue technique; B, C. Microchamber techniques; D. Microdrop technique; and E. Bergmann's plating technique.

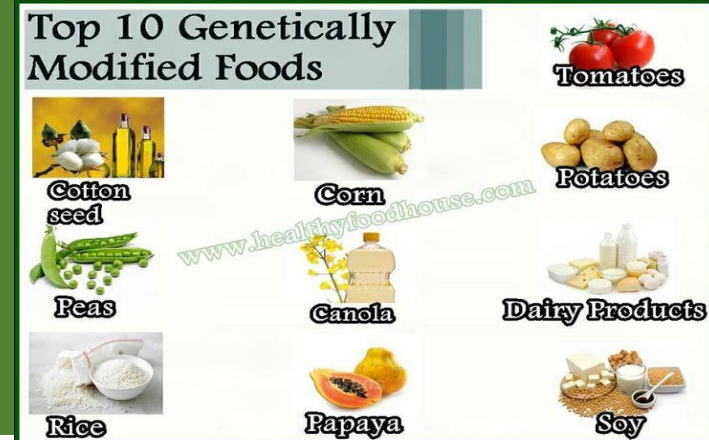


Genetically Modified Foods

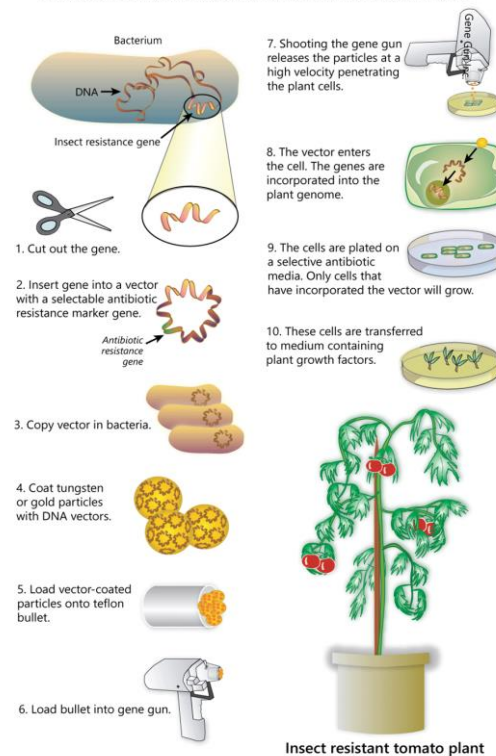
•Plants and animals that are genetically altered or spliced to gain an attribute not possible in the original species; advantages such as higher yields, disease resistance, and varied temperature tolerance. This shouldn't be confused with hybrids as hybrids are the product of selective breeding, not genetic splicing

•GMO plants are copyrighted; meaning that seed costs are higher and saving seed or cloning is probably not physically possible without the right enzymes, or legal - this makes the gardener dependent on the corporation

•Some concerns about long-term effects on people and cross-pollination mutations of existing species

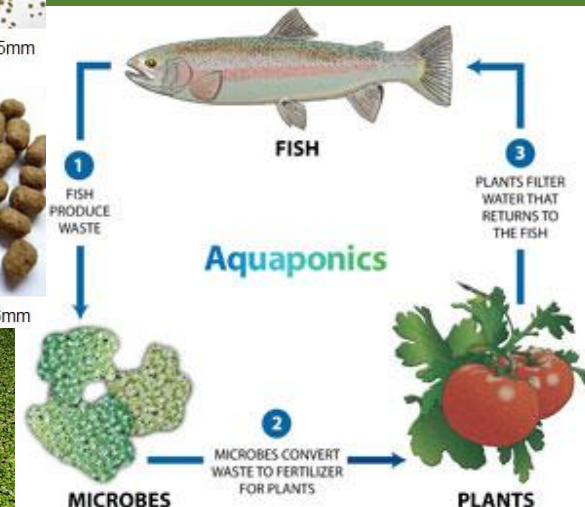
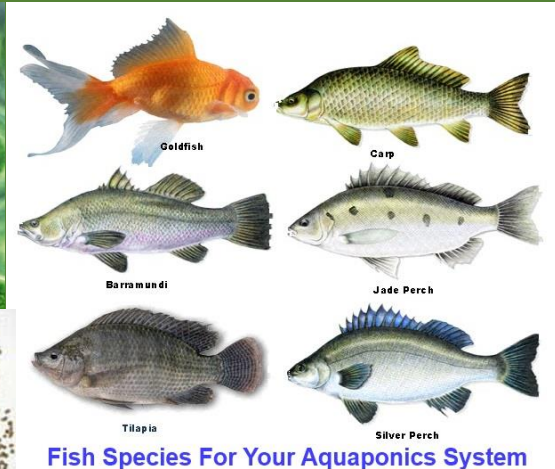
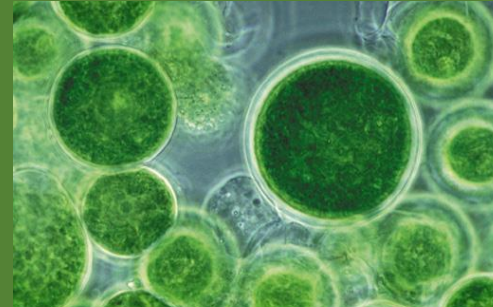


Creation of an Insect Resistant Tomato Plant




Converting to an Aquaponics System


- With a hydroponics system established, patching in an aquaculture system will eliminate some problems, but will initially create some issues
- The pH will need to go up from 5.8-6.5 into the 6.8-7.4 range; this will make it slightly difficult for the plant to absorb minerals, but the fish nutrients tend to compensate for that
- Many systems add a filter tank filled with Duckweed: a floating pond plant that processes the solid fish waste; the refined water leaves the Duckweed tank, then goes onward to the crops; the duckweed can be used as feed for vegetarian fish (ex: Tilapia and Carp)
- Any aquaculture and aquarium fish will work with aquaponics; however the aquaculture species produce quality meat (goldfish are an edible species of carp, but the ones from pet shops are sterile); Tilapia is the most popular: feeds on vegetation, prolific, easiest to breed, and tastes good
- Adding rabbit or chicken manure straight to the fish's water coupled with sunlight will encourage algae growth – which fish happily feed on and adds extra nutrients



Hydroponics vs Aquaponics



Hydroponics is a method of growing plants in water rather than in soil.



Aquaponics is the marriage of aquaculture (raising fish) and hydroponics (the soil-less growing of plants) that grows fish and plants together in one integrated system.

general

startup speed

bacteria

flood & drain

grow bed

nutrient supplementation

nutrient dumping

plant disease

temperature

pH

EC

eco system

With aquaponics it takes about a month to start your system by developing a colony of nitrifying bacteria through a process called 'cycling'. The ammonia from the fish waste will not be converted into the nitrates that the plants are seeking until this process is complete.

Bacteria are revered by aquaponic gardeners because, as described above, they are the engine that drives our systems.

When you move to an aquaponics system, however, the ideal schedule changes to flooding for 15 minutes every 45 minutes. The reason is that the grow bed now has taken on the additional role of being the filter for the fish waste. If you only ran the fish water through the filter every four to six hours, fish waste would build to dangerous levels.

An aquaponics grow bed is serving a dual role of both home for the plants and bio-filter for the fish waste, both need to be considered and optimized. Most media based aquaponic gardeners use 12" deep grow beds filled with an inert media.

The goal of an aquaponic garden is to achieve a state of balance within it's eco-system. Everything that goes into the system must work towards this end goal, and not harm any other element of the system.

In aquaponics you only top up the fish tank with water and never dump and replace it unless there is a severe, unexpected problem.

Pythium is almost non-existent in aquaponics.

In aquaponics, however, the primary requirements of the fish. The most widely used fish in North American aquaponics, after goldfish, are tilapia, and tilapia does best in water that is between 82 degrees and 86 degrees. The bacterium that drives the system is also happiest in that temperature range.

In aquaponics, pH is another factor that is compromised between the plants, fish and bacteria. Optimal pH is 6.8 - 7.0, which is again more closely related to what an organic soil gardener would target.

Aquaponic plants, are fed by the organic waste from the fish, which has very little salts. EC is therefore not a useful measurement for the concentration of nutrients in an aquaponics system. Aquaponics requires confidence in Mother Nature, rather than a managed system requiring intense control.

Aquaponics creates a complete eco-system in which various living creatures all interact to create a symbiotic whole. Aquaponics is, above all else, an ecosystem where plants, fish, bacteria, and worms all live together in a beautifully balanced symbiotic relationship.

Hydroponics is a system for growing plants under highly optimized conditions.

A better way to grow

Aquaponics uses a recirculating process to grow and harvest plants, and farm fish. Fish waste works with the beneficial bacteria in gravel and plants, creating a recyclable, concentrated compost.

1

Wastewater is pumped from the fish run to the upper gravel bed, where the bacteria break down the impurities. What remains is nitrogen, an essential nutrient for plants. Watercress is planted in the gravel bed as a secondary method of filtering the fish-run water, as well as a variety of harvestable crops, including tomatoes and salad greens.

2

The upper gravel bed is slightly angled so the water flows away from the pump to a drainage system at the back of the bed. Once there, the water drains down to the lower gravel bed.

3

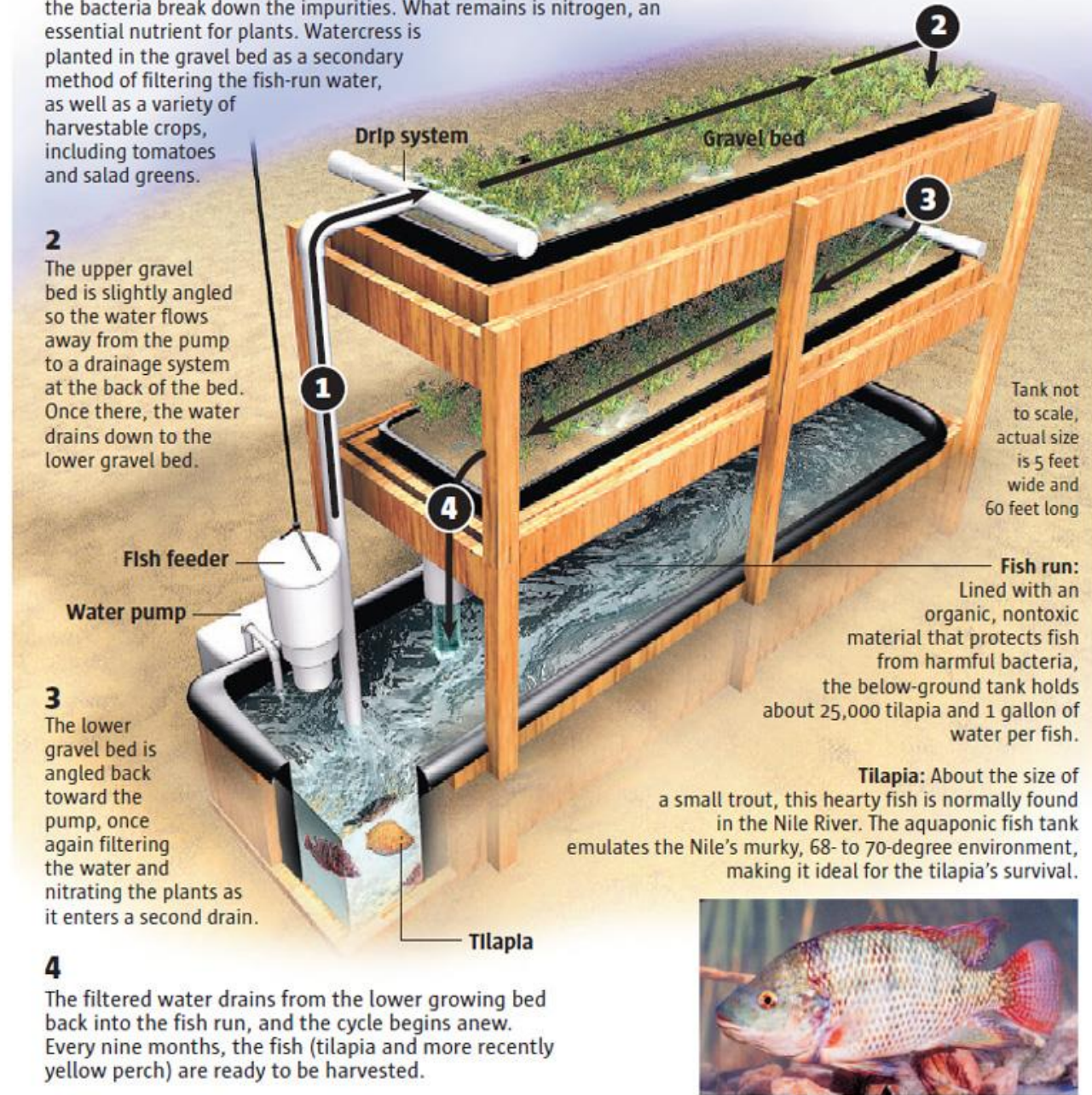
The lower gravel bed is angled back toward the pump, once again filtering the water and nitrating the plants as it enters a second drain.

4

The filtered water drains from the lower growing bed back into the fish run, and the cycle begins anew. Every nine months, the fish (tilapia and more recently yellow perch) are ready to be harvested.

Additional text by Colleen O'Connor, The Denver Post

Source: Paul Tamburello, founder Urban Organics, Growing Power Inc.



Tank not to scale, actual size is 5 feet wide and 60 feet long

Fish run: Lined with an organic, nontoxic material that protects fish from harmful bacteria, the below-ground tank holds about 25,000 tilapia and 1 gallon of water per fish.

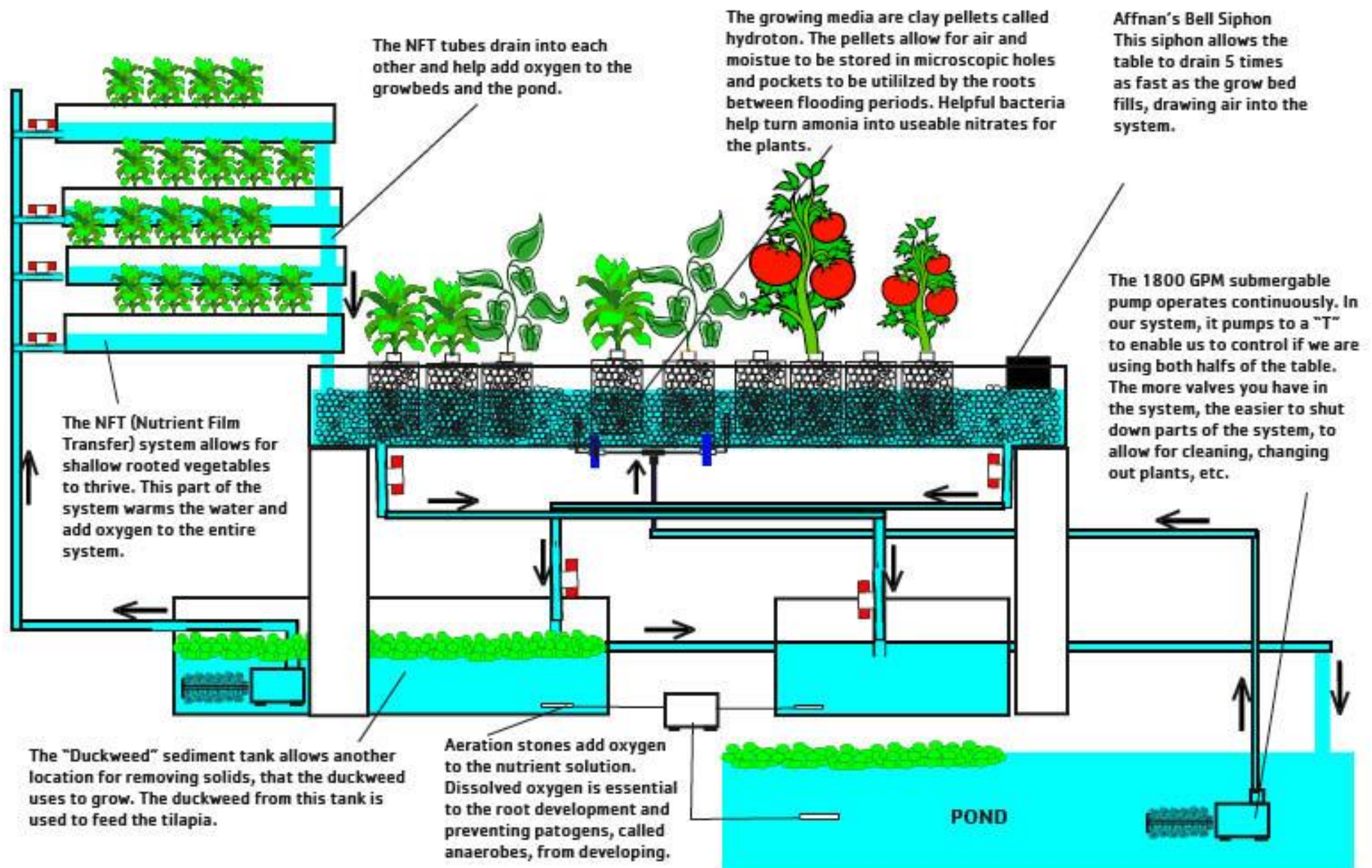
Tilapia: About the size of a small trout, this hearty fish is normally found in the Nile River. The aquaponic fish tank emulates the Nile's murky, 68- to 70-degree environment, making it ideal for the tilapia's survival.

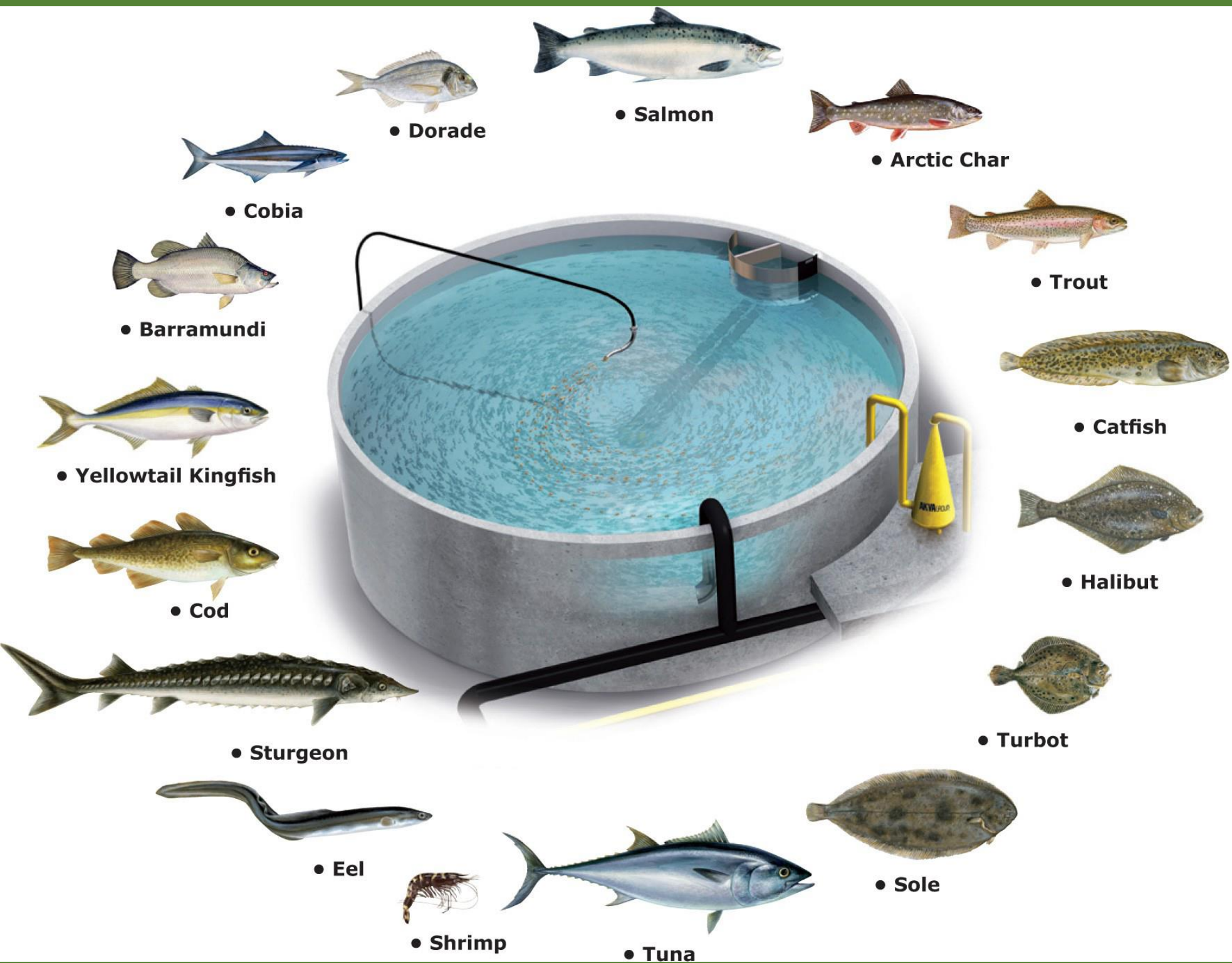


Associated Press photo, Moapa Valley National Wildlife Refuge

Jonathan Moreno, The Denver Post

Conversion from Hydroponic Ebb and Flow to Aquaponic NFT & Ebb and Flow System Plan





Pest Management

- Unlike traditional gardens, where pests and diseases are exposed to predators and treatments naturally, a closed off indoor hydroponics system will exacerbate these problems exponentially
- Check for signs of mealybugs, disease, plant damage by rodents daily; at the first sign of problems, treat all plants immediately and remove any and all affected
- Wash and sanitize all equipment after harvests; sterilize or dispose of used growing medium and containers after each successful crop



BAD BUGS (Garden Pests)



Aphid



Spider Mites



Thrip



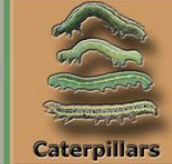
Fungus Gnat



Whitefly



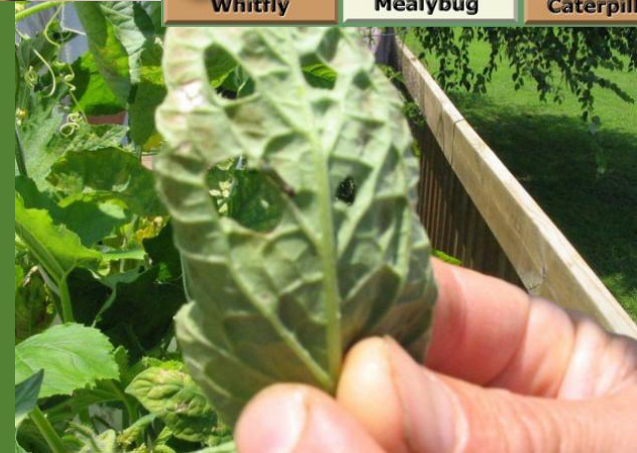
Mealybug



Caterpillars

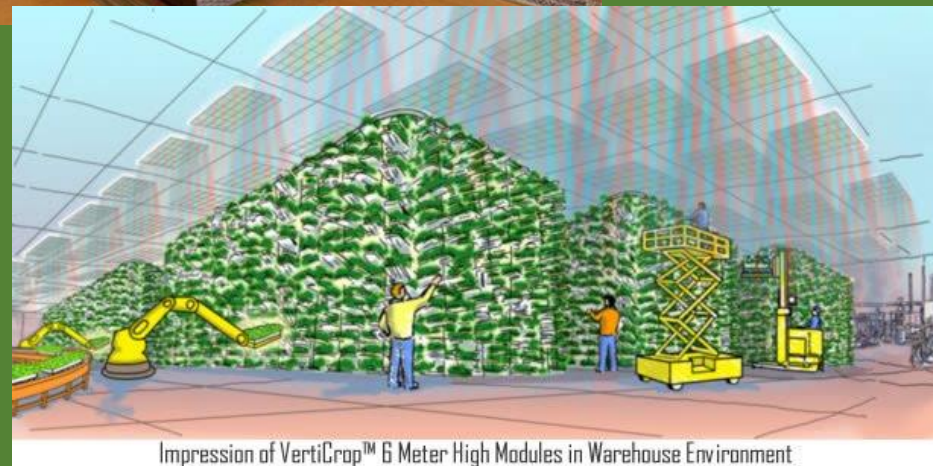
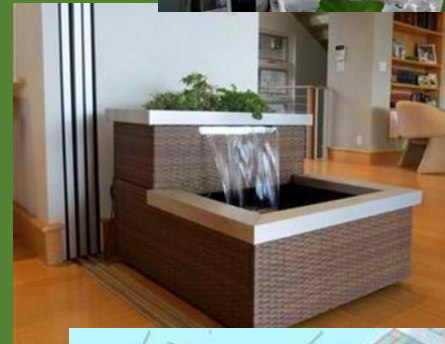


Leaf Miners



Future of Hydroponics

- Utah, as a majority semi-arid and highland steppe climate, would benefit greatly from hydroponic and aquaponic systems – especially with the occasional droughts, floods, and other natural and man-made disasters we are prone to
- Hydroponics works well with autonomous machines and robotics; a few such farms in America and Europe are fully automated, reducing labor needs; such systems are undergoing miniaturization by hobbyists and amateurs – there are many plans for automated hydroponics that uses a \$35 mini-computer and some simple hydraulic robots small enough to help monitor a growing system the size of a bookshelf
- These systems create fresh foods all-year round when done indoors; can be built into the kitchen, as part of the home's architecture, or as part of a room's decor



Impression of VertiCrop™ 6 Meter High Modules in Warehouse Environment

Kitchen Nano Gardens



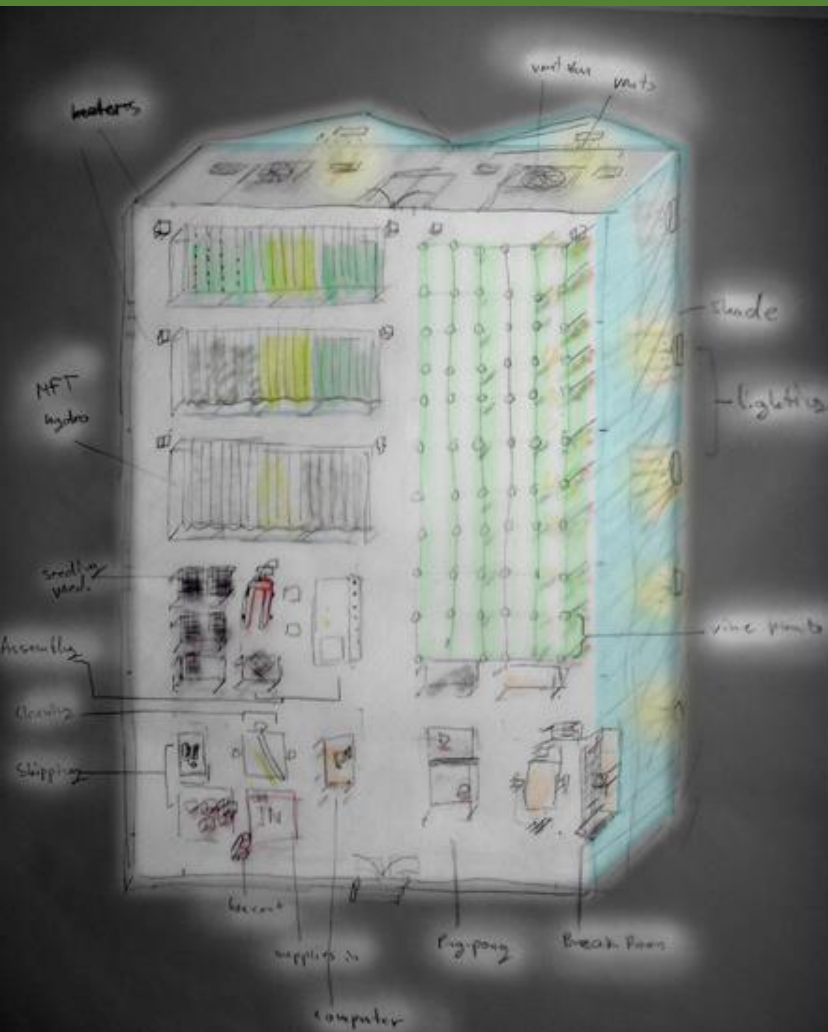
Backyard Garden (Hydroponics and Raised Beds)

Used to grow hundreds of pounds of vegetables/fruits/seasonings for 10 family's all-year round



Homestead/Factory Farm

120 acres of production compressed into $\frac{1}{4}$ acre;
Note the apartment/living space



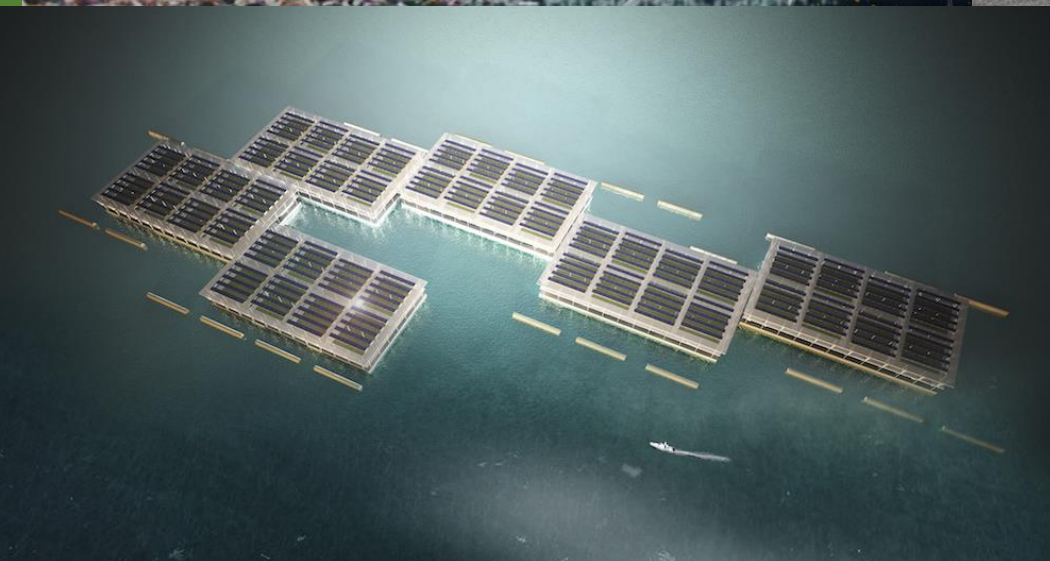
Concept of a “Green Grocer’s Store”

Vertical Aeroponics systems in urban areas



Floating Farms for Lakes and Reservoirs

Large-scale aquaponics floating outside a city



Small Livestock

West Valley City changed their codes allowing certain small livestock in residential areas again up to 4 animals total; and the State of Utah in 2019 passed zoning reforms that allows most activities on private property so long as it doesn't affect neighboring properties, which could include having over 4 animals on your property

Small livestock provide a great service to the gardener in extra kinds of foods, recycling waste efficiently, and is the difference between growing a few vegetables and true self-reliance

“If we have enough land and live where we can legally keep livestock, we should buy and raise some animals. Before we decide which animals we will raise, however, we must be prepared to care for them properly. This means learning about the food, shelter, and care they need in order to be healthy. Some animals that are easy to care for are chickens, rabbits, ducks, and milk goats.”

Duties and Blessings of the Priesthood; Lesson 22



“Every moving thing that liveth shall be meat for you; even as the green herb have I given you all things. ... And surely, blood shall not be shed, only for meat, to save your lives; and the blood of every beast will I require at your hands.”

(JST, Gen. 9:9–11.)

“And whoso forbiddeth to abstain from meats, that man should not eat the same, is not ordained of God; For, behold, the beasts of the field and the fowls of the air, and that which cometh of the earth, is ordained for the use of man for food and for raiment, and that he might have in abundance. And wo be unto man that sheddeth blood or that wasteth flesh and hath no need.”

(D&C 49:18–19, 21.)

Livestock Products

- Biggest return is recycling your garden waste and kitchen scraps into nutritive manure

- Rabbits, chickens, and goats provide milk, eggs, meat, feathers, and pelts (leather)

- If raising small animals research the many byproducts that comes from them

- Don't go overboard with animals or set-ups that require constant attention; this is meant to improve your life – not be an excess burden



Livestock Products and By-Products

Fresh Meat: standard meat cuts, hearts, kidneys, sweetbreads, and liver	Fur and downy feathers for Bedding/Stuffing/Insulation	Blood Meal	Writing Quills	Egg-based Immunizations (vaccine)
Eggs	Leather (light duty)	Bile Acids; anti-inflammatory, used for gall stones	Additives for Cellophane Plastics	Hyaluronic acid: “Chicken Shot” Knee
Canned Meat	Raw Hide	Pepsin; digestive aid	Carbon Paper Additive	Gene Treatment Proteins
Sausages	“Lucky” Rabbit's Feet	Chondroitin Sulfate; blood clot dissolution	Prussian Blue	Hormone Treatments
Rendered Fats	Methane (Natural) Gas	Fibrinolysin; blood clot dissolution	Lapinized Brains for Animal Vaccines	Phosphoric Acid
Dairy Products: milk, cream,	Charcoal	Chalones; anti-cancer therapy	Ammonia	Magnesium
Cheese, sour cream, yogurt, etc.	Fresh Manure	Casein (Wood) Glue	Bone Handles, Tools, and Jewelry	Glucosamine
Baby Formula	Compost	Rabbit Skin Glue	Bone Meal	Blood Plasma
Pet Food and Treats	Liquid Fertilizer		Insulin	
Honey/Royal Jelly	Feed for Night Crawlers		Glycerin	
Beeswax	Potassium Nitrate (Saltpeter)		Gelatin	
Fur Pelts	Calcium			
	Soaps			
	Candles			

Commercial and Natural Feed

- The debate between high processed commercial feed and natural, organic feed is more about preference and economy than results; both have good and bad qualities
- Commercial feed is nutritionally balanced for each type of livestock and is best fed only to the type it's made for – for example: not a good idea to give rabbits cat food; these feeds include added prebiotics/probiotics, vitamins/minerals/salt; downside is higher cost compared to feeding a natural diet
- Natural diets consist of feeding fresh and dried hay/grass mix, fresh vegetables & fruits, & providing a salt/mineral lick; upside is lower cost feed and most grown on your property; downside is a sizeable part of your garden is strictly for feed, nutritional values fluctuates due to quality of feed, and animals are more susceptible to disease and parasites
- A mix of both feeds gives a good balance of benefits



Animal Harvesting

- Small animal harvesting is allowed in city limits for strictly non-commercial animal production
- The harvesting from start to finish must be performed away from public view (a shed or clean garage); all blood and entrails must be thoroughly disposed of by means of collection in a disposable container and placed in outside trash cans (similar to how we handle rancid and spoiled meats)
- Animals must never be shot (per city firearms ordinances), or abused in any way when harvesting – poor treatment releases acids into the meats and makes it taste and feel off: abuse is not delicious



Mayor Ben McAdams
Sanitation and Safety Bureau
Environmental Health Division

April 30, 2014

Dear Mr. Park,

The Salt Lake County Health Department has reviewed your concerns regarding Board of Health Regulation #7 – 4.1.4 which prohibits the slaughtering of animals in non-agricultural zoned areas of Salt Lake County. The Health Department's public health concern with this activity is the improper disposal of animal entrails and blood, which have a direct negative impact on community fly control and related diseases.

The Health Department will allow on-site slaughtering of rabbit stock provided that this activity is conducted in a location out of sight of the general public, i.e., a closed garage or shed. The Department also requires that animal entrails and blood be completely removed and properly disposed of to avoid attracting flies.

Your concerns have raised a compelling debate as to the need for this prohibition when animals are slaughtered for non-commercial purposes. Other general solid waste control requirements in Regulation #7 should cover the health concerns associated with this activity. This issue will be discussed in a future regulatory review.

Please contact me if you have any concerns or additional questions.

A handwritten signature in blue ink, appearing to read 'Dale Keller'.

Dale Keller, LEHS
Bureau Manager
Environmental Health
385-468-3791

Rabbits

- Rabbits provide the best return on investment: cheapest and easiest to feed, breed, and harvest – initial investment costs are low
- Best suited for an urban environment: very quiet (does make squeals like a piglet when in danger), manure when dry produces very low odor, doesn't produce a musk or pheromone odor detectable by humans
- Small space requirements – rabbits thrive confined in hutches
- They eat garden wastes, kitchen waste, weeds, and grasses; turning it into many kinds of products for the home; manure does not require composting
- Rabbits need physical attention if they're to be easy to handle; they are also VERY nervous and even a loud noise can startle them to death



Rabbit Facts

• Rabbits are not rodents – they are lagomorphs (order Lagomorpha, family Leporidae); their closest related species is the Hare and the Pika (think Pikachu); unlike rodents, lagomorphs retain excess nutrients in their bodies, the skin separates from the carcass with ease, and they reproduce en mass - making them ideal for food

• A breeding stock of 1 buck & 3 does produce an average 960 lbs. of carcasses in a year, the same amount of meat and bones as a beef cow; rabbits have an average of 6-8 bunnies every 31 days – 16 bunnies at most if both uterus's are fertilized; could re-breed immediately if only one uterus is bred, but best after 1-3 weeks

• Medium meat breeds such as New Zealand Whites & Californians are the best for their meat-to-feed ratios; mixing medium weights with a large breed, such as Flemish Giants, produce much more meat and still retain lower costs; rabbit breeding can lead to very large species – such as the one pictured here from Germany

• Many city and suburban families from the Great Depression era credit their rabbits as having saved them from starvation



RABBIT IS KING	
RABBIT	
FEED	CALORIES/LB
4 LBS FEED	795 CALORIES
PER 1 LB MEAT	LBS PER FEMALE
	320 LBS OF MEAT/YEAR
	CHOLESTEROL LEVEL (MG/100G)
	164 MG
BEEF	
FEED	CALORIES/LB
24 LBS FEED	1440 CALORIES
PER 1 LB MEAT	LBS PER FEMALE
	300 LBS OF MEAT/YEAR (BOXED)
	CHOLESTEROL LEVEL (MG/100G)
	230 MG

Rabbit Housing

- Salt Lake County Health Department requires that hutches be single-level, well ventilated, secure, located at least 15' from any house and over bare soil; also recommending hutches be at least 3 feet above the soil; pictured is our new hutch – we later added an extra foot to the height, removed the sunken nesting boxes, and added a manure collection system
- Our home system has two hutches, four cells total for the breeding rabbits and a single communal hutch with a sequester cell for the litter to finish growing up in; the sequester cell is where we place the fryers for the 24-hour starvation period before harvesting
- Do not use chicken wire at all – rabbits can easily bite through it; they can also bite through hardware cloth with some difficulty; best use 18 gauge livestock fencing with minimum ½” space in-between
- Provide a nesting box for your doe's and it must be removable; we made a mistake with permanent sunken nesting boxes and many of the bunnies died from disease and chills
- Rabbit Runs are best used for clearing a garden of weeds and fertilizing at the same time; do not leave them in there permanently as rabbits will burrow out



Rabbit Feeding

• Pellets are the easiest way to feed your rabbits a balanced diet, but also the most expensive

• They will thrive on grass and hay, such as timothy and alfalfa; and feed a mix of leafy vegetables mixed with roots and fruits – provide a mineral salt lick

• Rabbits love certain weeds like dandelion, milkweed, clover and crabgrass; they will also thrive on lawn grass so long as no pesticides or herbicides are used

• Do not feed them anything (leaves, fruits, stems, roots) from peppers, tomatoes, potatoes, or noxious weeds



Is your rabbit a healthy weight?

Give your rabbit a feel, to find out what's under the fluff!

1

VERY THIN



- Spine, ribs and hip bones feel sharp and prominent, with no padding.
- Depressions around the pelvis and spine.
- Loss of fat and muscle means limbs feel thin and bony, and ability to move may be compromised.

2

THIN



- Spine ribs and hip bones are easy to feel.
- Little fat and some loss of muscle.

3

IDEAL



- A smooth curve from neck to tail and hip to hip.
- Spine, ribs and hip bones easy to feel, but rounded not sharp, like they are covered in a thick cloth.
- Some rabbits, particularly females, may have a roll of fur under the chin (called a dewlap), this should just feel like a fold of skin when gently pinched.

4

OVERWEIGHT



- You need to apply pressure to feel the ribs, spine and hip bones.
- You bunny generally feels round and well padded.
- Females may have a large dewlap that's feels like a roll of fat when pinched.

5

OBESE



- Impossible to feel the ribs; the spine and hip bones are tough to feel.
- Rolls of fat around the ankles, tail and neck, and a saggy tummy.
- Difficultly moving about freely.

If you are worried about your rabbit's weight, please talk to a vet!

Learn more about bunny diets - www.theRabbitHouse.com/diet

Rabbit Breeding

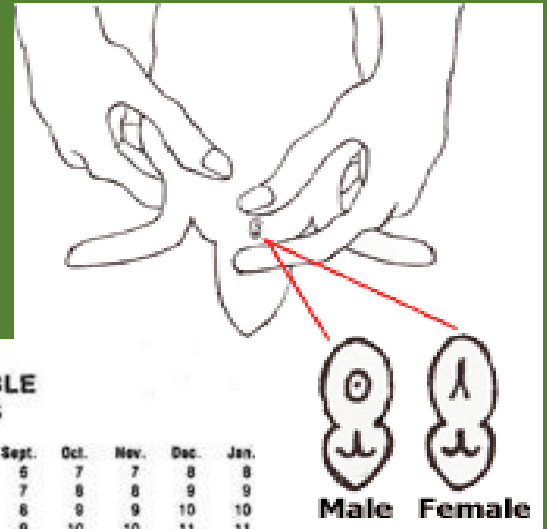
•Mid-sized breeds New Zealand's and Californians fully mature around 6 to 7 months; and heavy breed Flemish at 9 to 12 months

•Be sure to feed both doe and buck a good diet before breeding; if just fed a meager diet, the bunnies will not be capable of weaning off their mother and will perish

•Introduce her into his cage when ready to breed; if he goes into hers, she will beat him up

•The male will chase the female for a while, but eventually he will mount her, do his thing, give a pronounced groan and fall down to the side – this means he successfully bred with her; remove him and give her extra vegetables

•Gestation is 31 days until birth



**31 DAY
GESTATION TABLE
FOR RABBITS**

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1	1	4	4	5	5	6	6	6	7	7	8	8
2	2	5	5	6	6	7	7	7	8	8	9	9
3	3	6	6	7	7	8	8	8	9	9	10	10
4	4	7	7	8	8	9	9	9	10	10	11	11
5	5	8	8	9	9	10	10	10	11	11	12	12
6	6	9	9	10	10	11	11	11	12	12	13	13
7	7	10	10	11	11	12	12	12	13	13	14	14
8	8	11	11	12	12	13	13	13	14	14	15	15
9	9	12	12	13	13	14	14	14	15	15	16	16
10	10	13	13	14	14	15	15	15	16	16	17	17
11	11	14	14	15	15	16	16	16	17	17	18	18
12	12	15	15	16	16	17	17	17	18	18	19	19
13	13	16	16	17	17	18	18	18	19	19	20	20
14	14	17	17	18	18	19	19	19	20	20	21	21
15	15	18	18	19	19	20	20	20	21	21	22	22
16	16	19	19	20	20	21	21	21	22	22	23	23
17	17	20	20	21	21	22	22	22	23	23	24	24
18	18	21	21	22	22	23	23	23	24	24	25	25
19	19	22	22	23	23	24	24	24	25	25	26	26
20	20	23	23	24	24	25	25	25	26	26	27	27
21	21	24	24	25	25	26	26	26	27	27	28	28
22	22	25	25	26	26	27	27	27	28	28	29	29
23	23	26	26	27	27	28	28	28	29	29	30	30
24	24	27	27	28	28	29	29	29	30	30	31	31
25	25	28	28	29	29	30	30	30	31	1	2	2
26	26	29	29	30	30	31	31	31	1	1	2	2
27	27	30	30	31	1	1	1	1	2	2	3	3
28	28	31	1	1	1	2	2	2	3	3	4	4
29	1	1	2	2	3	3	3	3	4	4	5	5
30	2	2	3	3	4	4	4	4	5	5	6	6
31	3	3	4	4	5	5	5	5	6	6	7	7

TO READ CHART

Find the month you bred the doe.
Go down the column until you find the day bred.
Move horizontally (to the right) until you reach the next number.
This will be 31 days from the date bred.

Rabbit Birthing

•A note of warning: a doe will release pheromones during birth that's similar to heat – if the buck get's to her during delivery she could kill the bunnies in an escape attempt, **DO NOT LET HIM NEAR HER!**

•A few days before birth, provide the doe with plenty of dry, fresh straw and a nesting box; she'll assemble the nest, line it with fur, and do the rest – nothing else is needed from you; be sure the straw is dry as green grass and wet straw has water that evaporates and the chill kills the newborns

•Check all newborn bunnies as soon as possible: distract the doe with some kind of treat and remove the nesting box; after rubbing some fur on your hands, look for jerking movements, remove any dead ones, check their bellies for milk, and replace quickly

•Bunnies will grow fur after 7 days; if she's had too many to care for, feed the smaller rabbits with a medication syringe and a concentrated kitten formula; insert the nipped syringe deep in the bunny's mouth and push warm formula in hard – mimicking the mother's nursing



Angora Rabbits

- As previously mentioned, Angora breeds are not good for food, but provide excellent spinners wool; unlike meat rabbits, the Giant Angora breed is very desirable while medium breeds grow the same wool in smaller amounts; their manure is just as good for the garden
- During shedding times, the wool can be simply brushed out with a thick brush, sometimes this isn't enough for a project and West Valley summers get extremely hot – best to shear in the springtime
- Commercial Angora farms strap the rabbit to a rack by it's four feet in a prostration position to quickly clip the wool, but one can train rabbits to relax during collection; begin at the back with a set of shearing clippers or electric shearer and work your way forward; the rabbit will need to grow accustomed to this, and will overtime; leave most of the paws, face, tail, and ears unsheared
- Wash and rinse the wool, allow to dry thoroughly before carding; one Angora produces 8 – 32 ounces of wool per year depending on the breed
- Lanolin comes naturally from simmering wool for several hours, filter out wool fibers, and condense the solution; the gel left is lanolin



Rabbit Harvesting

Harvesting rabbits is a solemn act that must be undertaken with a spirit of thanksgiving for what you're about to receive; the first time is always difficult

From birth to fryer weight takes between 52 - 70 days depending on nutrition and well being; weight the rabbit in question – if it's 5 lbs., it's ready. A dressed rabbit carcass weighs 2 ½ lbs

Make sure the rabbit being harvested has no food 24 hours beforehand; do provide water; dispatch the rabbit in the most humane and quickest way possible; use a breaking board; there are good videos online that give a step-by-step method

Check the rabbit's meat for signs of inflammation, the entrails for signs of worms, liver for spots and cysts, and look for signs of any inconsistencies in any part of the rabbit – check a reference guide; some diseases and parasites can spread to humans, so be very cautious; when in doubt – throw it out

Salt Lake County Health Department requires the act is done in a non-visible space (garage or shed), and that blood and entrails not being used for sausage casings are disposed properly – similar to how we dispose of rotten meat

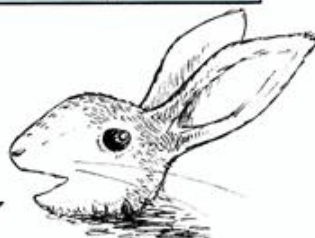


Phillip the Rabbit explains:

HOW TO SKIN a Rabbit



AND THAT'S ABOUT IT! DON'T FORGET TO REMOVE MY GUTS, AND THEN COOK ME HOWEVER YOU LIKE- I SUGGEST A PIE!



Rabbit Carcass Chart



Top



Side



Belly

Views Of Forequarters

Although very young and of a 'non-meat' breed (7 week Rex buck), this animal shows good conformation and muscling in the forequarters for its age.



Top



Side



Belly

Views Of Hindquarters

The hindquarter of this youngster shows remarkable development in muscling and fat deposition, leading to a very appetizing and useful, if light in weight, carcass.



Loin is evaluated:
Width, above L
Interior, above R
Thickness, below L

Light transmission through the flank muscle helps determine thickness of loin and flank muscling, at left.



Note the muscle on either side of the spine, causing a dip over the spine itself. This shows superior muscle development and is very desirable.

Poultry and Fowls

- Poultry and fowls in the garden provide a great service by grazing weeds and weed seeds before crop planting, eating pests, and laying eggs daily

- Examples include chickens, ducks, geese, pigeons, quail, etc.

- Requires a little of set-up and non-specific feed

- Chicken roosters are still forbidden due to noise ordinances and hostility issues

- Manure does require composting



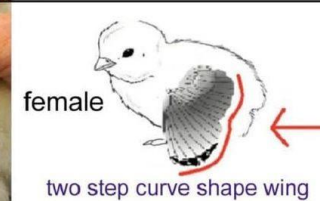
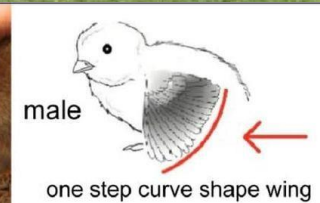
Poultry and Fowl Facts

•Most will lay for 3 years; at an average of 1-2 eggs per day; the average hen lays 210 eggs in one year, while a very good layer can go as high as 300; duck eggs are larger than chicken eggs and have a higher protein content, but ducks lay less often; geese lay much less often and are mainly raised for their meat

•Ducks and geese require a pond or body of water for health reasons; never use soap or alcohol on them – their feather's oils help them float and they can drown

•Quails raised indoors in a cabinet thrive well; they lay the smallest eggs of all poultry and as often as ducks; perfect for apartments and condos

•In the Great Depression, families would feed most anything to their chickens – a good way of disposing leftovers; in WWII it was mandatory for households in select urban areas to have 2 laying hens per person



Backyard Chickens 101

The backyard chicken debate is ruffling feathers across Canada. A growing number of proponents of the feathered birds are popping up in various cities from coast-to-coast wanting bylaws that allow city folk to keep the chickens in their yards.



A female chicken (egg layer) is called a hen.



A male chicken is called a rooster.



A bantam is a miniature chicken, usually about 1/4 to 1/2 the size of a regular chicken.



Hens generally lay one egg every one to three days, less in the cold, darker winter, more in the sun and warmth.



Roosters do the crowing (quite loudly) — starting at six to 10 weeks. Hens don't make much noise; may squawk when they are excited.



One rooster will do for every eight to 12 hens if you want to produce fertile eggs.



On the average, three hens will give you two eggs a day. That means to get a dozen eggs a day, you would need 18 hens.

A hen will lay eggs with or without a rooster present. If you want fertilized eggs, then you do need a rooster.



Pros of backyard chickens

- Fresh eggs everyday
- They'll eat your scrap food
- Provide organic pest control in your yard

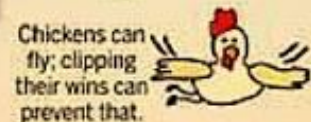


Cons of backyard chickens

- Takes time to feed and clean out the coop
- Chicken poop smells and can carry diseases
- Predators will try to eat chickens (Raccoons, foxes, hawks, dogs, etc)



Chickens live about 10 years



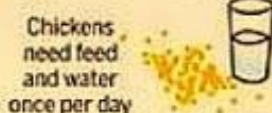
Chickens can fly; clipping their wings can prevent that.



It takes an egg about 21 days to hatch.



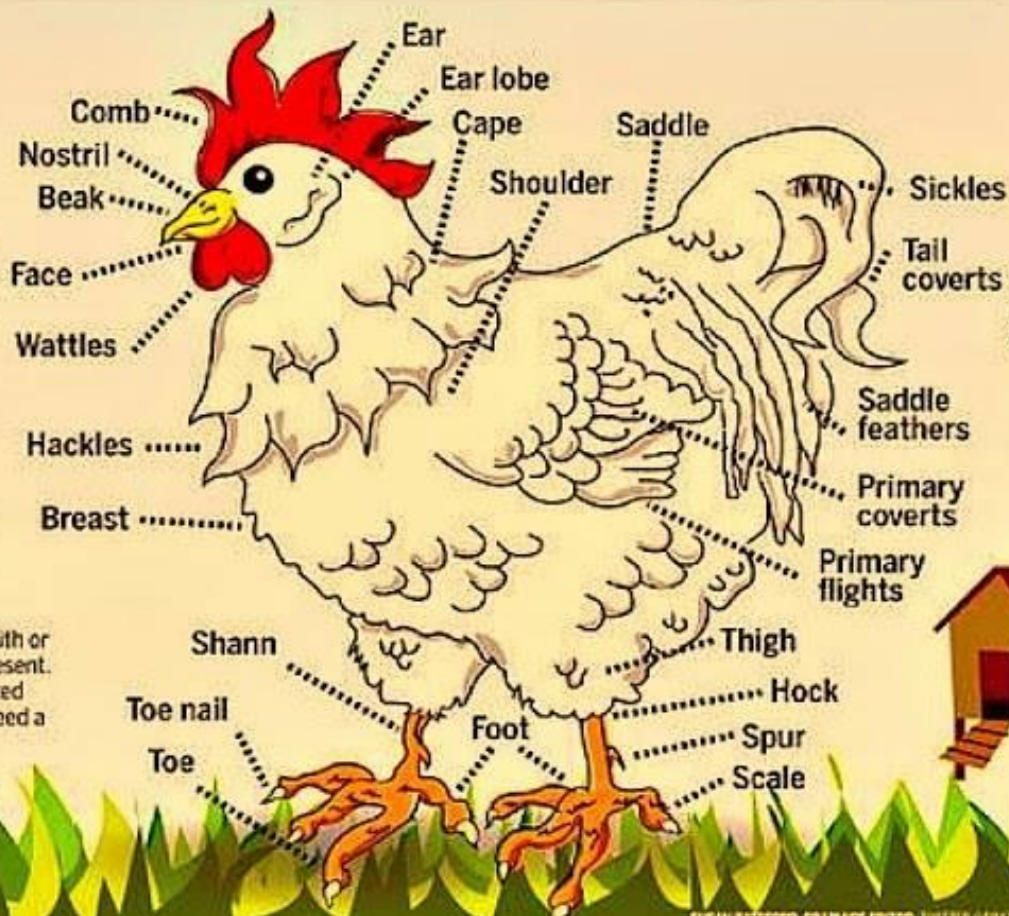
Chickens are social animals — they should be in a group of at least three.



Chickens need feed and water once per day



Each chicken needs about two to three feet of space in a coop and four to five square feet in an outside run.



							
	Golden Laced Wyandotte	Barred Plymouth Rock	Rhode Island Red	Light Sussex	Rhode Rock	Goldline	Dotte Rock
ORIGIN:	Wisconsin 1880s	New England 1840s	Rhode Island 1800s	England 43 AD			
TYPE:	Heritage	Heritage	Heritage	Heritage	Sex-Linked Hybrid	Sex-Linked Hybrid	Sex-Linked Hybrid
USE:	Dual Purpose	Dual Purpose	Dual Purpose	Dual Purpose	Dual Purpose	Dual Purpose	Dual Purpose
EGGS:	 Large Brown	 Large Brown	 Extra Large Brown	 Large Light Brown	 Large Brown	 Large Brown	 Large Brown
EGG PRODUCTION:	 Above Average	 Excellent	 Excellent	 Average	 Unbelievable!	 Unbelievable!	 Unbelievable!
MEAT PRODUCTION:	 Above Average	 Excellent	 Above Average	 Excellent	 Average	 Average	 Average
HEAT TOLERANT:	 Above Average	 Average	 Above Average	 Above Average	 Above Average	 Above Average	 Above Average
COLD TOLERANT:	 Above Average	 Excellent	 Excellent	 Above Average	 Above Average	 Above Average	 Above Average
FORAGING:	 Average	 Above Average	 Average	 Excellent	 Above Average	 Above Average	 Above Average
BROODINESS:	Infrequent	Infrequent	Infrequent	Common	Infrequent	Infrequent	Infrequent
MATURITY:	20 weeks	20 weeks	19 weeks	20 weeks	20 weeks	20 weeks	20 weeks
PERSONALITY:	Docile, Friendly	Docile, Inquisitive	Docile, Friendly, Roosters can be aggressive	Very Docile & Friendly	Extremely friendly, Easy going	Extremely friendly, Easy going	Extremely friendly, Easy going
SIZE:	8.0 pound roos 6.0 pound hens	9.5 pound roos 7.5 pound hens	8.5 pound roos 6.5 pound hens	9.0 pound roos 7.0 pound hens	8.0 pound roos 7.0 pound hens	8.0 pound roos 7.0 pound hens	8.0 pound roos 7.0 pound hens



The data presented in this chart describes general characteristics of various chicken breeds. All characteristics vary among individual birds within any breed. Copyright 2013, Don Gangnagel. All Rights Reserved.

Chicken Housing

•A large, permanent coop isn't practical for our yard sizes – look into building an ark or hutch

•An ark is both legal and inexpensive; installing a traditional coop requires a building permit; an ark must include 2' X 3' space per hen, a sheltered area for sleeping, a couple of shared nests lined with straw for laying, and a fenced area with access to grass or ground cover; place a light and heater inside for cold weather; moving the ark around the yard every week will help eradicate weeds and fertilize the soil (bury the manure deep in the soil)

•Chicken hutches are similar to rabbit hutches; chicken hutches have built in manure trays, keep mice and rats away from your flock, and helps with cleanliness; without access to soil, add some grit to homemade feed – this method has more benefits compared to an ark

•West Valley City requires stationary coops be thoroughly cleaned once a week; manure and waste either composted or disposed of in the waste bin



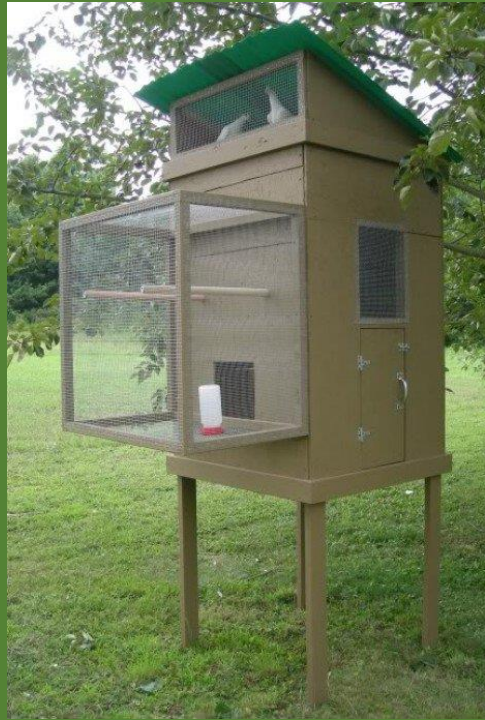
Duck Housing

- Ducks have physical need of open water access, so add a kiddie pool they can swim in; to avoid housing permit issues, a small, movable run cage is the best option
- Domestic ducks raised in a yard become localized to that yard and do not like to leave it; so not penning up ducks is an option with larger yards, but does make egg collection into a hunt
- Ducks are very cold hardy compared to other fowls and are left in the elements most of the time, but require a shelter for winters below 36° F



Pigeon Housing

- Pigeon houses are heavily regulated by the health department as pigeons have a high disease risk: best to use a large, elevated coop for easier cleaning and sanitation
- Sanitation and odor control is vital for pigeons as they are more vulnerable to incubating parasites and other diseases compared to chickens and quail – be sure droppings fall on bare soil and the clean coop once a week without fail
- Provide individual nesting boxes: pigeons mate in pairs for life and will not share nests like chickens; provide a container for the female to nest
- Food and water is distributed via on-the-wall feeders with perches
- Access to the outdoors is also necessary; if raising pigeons for meat this is a simple cage; for racing and carrier pigeons take them out regularly for testing and exercise



Quail Housing

- Quails are $\frac{1}{4}$ the size of chickens and ducks, and so thrive well in much smaller hutches
- Unknown whether indoor raised quail can exceed the 4 livestock limit; a breeding set of 20 supplies a family as well as 4 chicken hens, with the added luxury that most male quails do not crow (Corturnix and Bobwhite males will crow occasionally but it sounds more like songbird than rooster)
- Provide separate areas depending on your goals for the flock; separate laying hens from those destined for harvesting and keep both separate from breeding pairs
- Clean every other day if keeping indoors: disease and odor build up very fast with any kind of fowl; adding cedar chips will help with odor and urine issues; a dust box filled with sand and ashes helps quails clean themselves



Egg Hatching

•Chicken roosters are not legal in West Valley due to noise ordinances, so breeding your own chickens isn't possible right now; male ducks, quails, pigeons, etc. are legal to have

•Most commercial breeders deliver day-old chicks for raising; chicks can be mail ordered - arrive in overnight delivery and are held at the Post Office until claimed by the purchaser

•To hatch your own eggs, collect from a local breeder and place in an incubator; since eggs require periodic turning and precise heat, a computerized/mechanical incubator may be best for those who have a life

•When the eggs hatch don't assist the chick – it needs to work it's way out alone



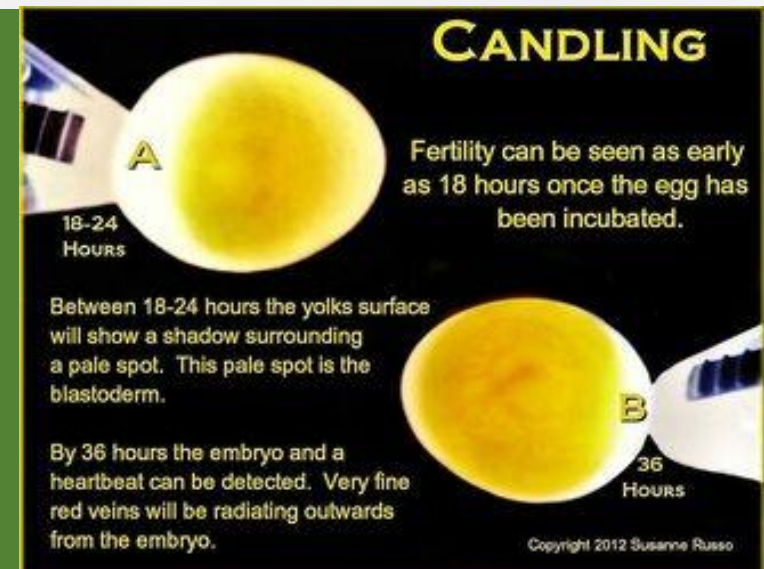
Feeding

- Fowls are scavengers: during the Great Depression, families would feed most anything to them – good way of disposing of leftovers
- Feeding cooked leftovers (meat, grains, veg, etc.) is frowned upon by Dept. of Health and Dept. of Ag.: their major concern is the leftovers attracting rodents and flies - still allowed, but frowned upon
- Feed from the store is very well balanced and does provide nutritional advantages; but can get expensive, and if not stored properly or left on the ground will attract rodents
- These animals need to forage and scratch for their diets; provide a scratch of seeds for them to dig for
- While digging, fowls and poultry will intentionally swallow small gravel – this is necessary for them to digest food
- Do not feed tap water to quails – too much fluoride and chlorine; filter it



Egg Collection

- By far, most people only keep poultry for the eggs
- Chickens will start laying after 4 months; collect eggs 3 times a day for best results; ducks will lay once a day and their eggs are slightly larger and thicker than chicken eggs; quail's lay once to twice a day and have eggs 1/3 the size of chickens
- If your flock does have a rooster / drake cooped with the females then you must candle each of the eggs collected to see if it's fertilized
- Eggs require washing before use: some are free from visible dirt and fecal matter, and can be dry washed by rubbing with 320 grit sandpaper; other eggs require a good scrubbing in soap or commercial egg cleanser
- Sometimes you can find hidden eggs that you can't tell if it's good or not: place in a bucket of water, if the egg sinks, it's good; if it floats, throw it out
- If keeping a large number of eggs outside of the fridge (say, in a root cellar), then place the eggs in a solution of Waterglass (sodium silicate); rinse before use



COMPOSITION OF AN EGG

Shell

- Outer covering of egg, composed largely of calcium carbonate
- May be white or brown depending on breed of chicken.
- Color does not effect egg quality, cooking characteristics, nutritive value or shell thickness

Air Cell

- Pocket of air formed at the large end of egg
- Caused by contraction of the contents during cooling after laying
- Increases in size as egg ages

Shell Membranes

- Two membranes-inner and outer shell membranes surround the albumen
- Provide protective barrier against bacterial penetration
- Air cell forms between these two membranes

Yolk

- Yellow portion of egg.
- Color varies with feed of the hen, but doesn't indicate nutritive content
- Major source of egg vitamins, minerals, and fat

Thin Albumen (White)

- Nearest to the shell.
- Spreads around thick white of high-quality egg

Germinal Disc

Vitelline (Yolk) Membrane

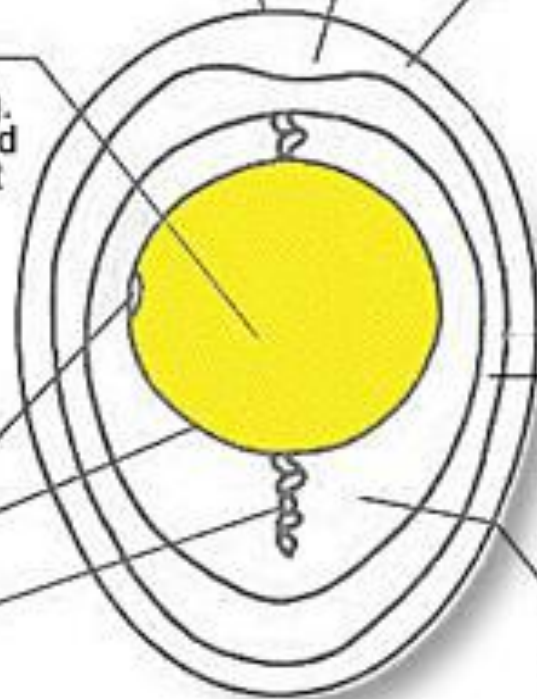
- Holds yolk contents

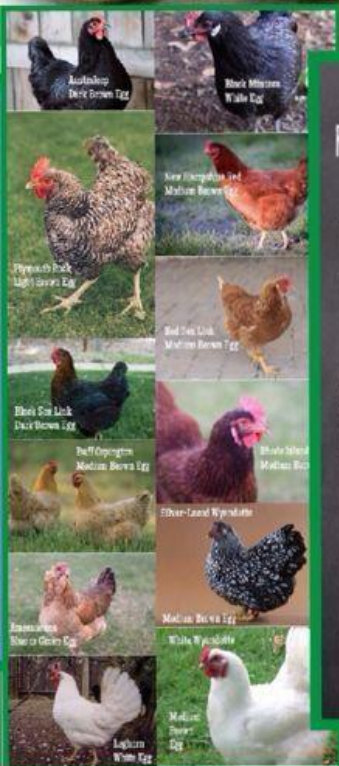
Chalazae

- Twisted, cordlike strands of egg white
- Anchor yolk in center of egg.
- Prominent chalazae indicated freshness

Thick Albumen (White)

- Major source of egg riboflavin and protein.
- Stands higher and spreads less in higher-grade eggs
- Thins and becomes indistinguishable from thin white in lower-grade eggs





A Foodservice Guide to Shell Eggs

Egg Size

JUMBO	EXTRA LARGE	LARGE	MEDIUM	SMALL	PEE WEE

Minimum wt. per dozen

30 oz.	27 oz.	24 oz.	21 oz.	18 oz.	15 oz.
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Minimum wt. per 30 dozen case

56 lbs.	50.5 lbs.	45 lbs.	39.5 lbs.	34 lbs.	28 lbs.
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Egg Quality

	Grade AA	Grade A	Grade B
Break Out Appearance			
	Covers a small area	Covers a moderate area	Covers a wide area
Albumen Appearance	White is thick and stands high; chalazae prominent	White is reasonably thick, stands fairly high, chalazae prominent	Small amount of thick white, chalazae small or absent. Appears weak and watery
Yolk Appearance	Yolk is firm, round and high	Yolk is firm and stands fairly high	Yolk is somewhat flattened and enlarged
Shell Appearance	Approximates usual shape; generally clean,* unbroken; ridges/rough spots that do not affect the shell strength permitted		Abnormal shape; some slight stained areas permitted; unbroken; pronounced ridges/thin spots permitted
Usage	Ideal for any use, but are especially desirable for poaching, frying, and cooking in shell		Good for scrambling, baking, and use as an ingredient in other foods

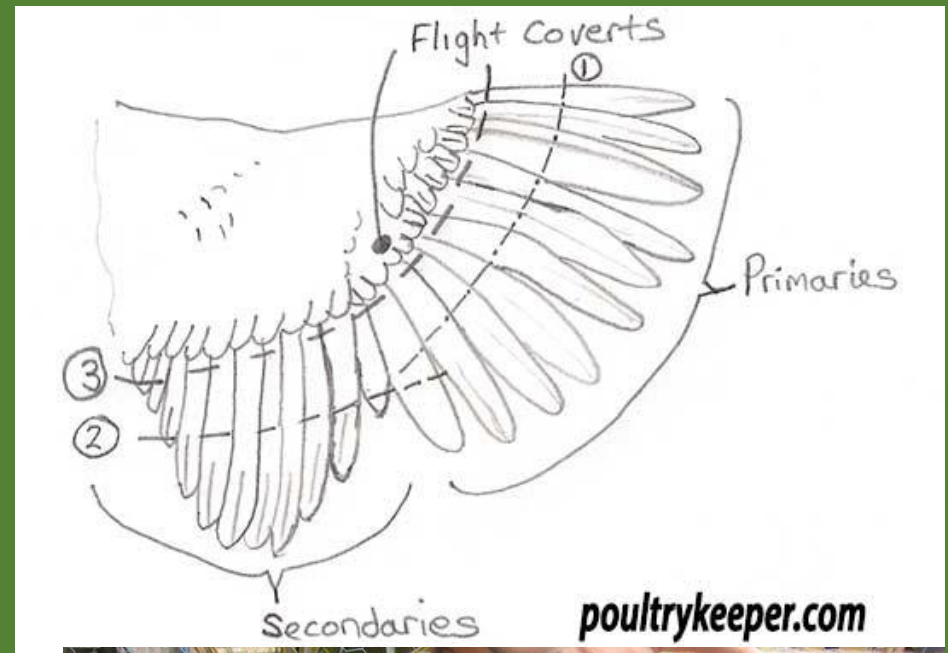
*An egg may be considered clean if it has only very small specks, stains or cage marks. Source: USDA

Egg Size Substitutions

Jumbo	X-Large	Large	Medium	Small
1	1	1	1	1
2	2	2	2	3
5	5	6	7	8
9	10	12	13	15
18	21	24	27	28
37	44	50	56	62

Wing Clipping

- All agricultural poultry and fowl have some ability to fly; chickens and domestic ducks only use their wings as an assistance for high jumping; quails can fly for short distances
- Clipping wing feathers helps prevent hens escaping to the neighbors yards or into the streets
- Have your veterinarian demonstrate how to clip wings as some feathers have large capillaries that can lead to bleed out if cut improperly



Harvesting

- Harvest in the most humane and quickest way possible, but will still be a learning curve; there are videos online that provide good instructions
- The best method I've found is using cones to hold the bird upside-down and quickly remove the head; Salt Lake County requires that all blood and entrails be collected and disposed of properly
- Many folks do not like to pluck the feathers and hairs off by hand (yes, they have hair); a motorized plucker saves time and effort
- Build a manual plucker: purchase or mold silicone or rubber “fingers” encasing machine bolts for attaching to a base; first scald your poultry in hot water (about 180° - 200° F) for about 2-3 minutes each; let drip for a minute and vigorously pull the poultry over the nubs – shouldn't take more than 5 minutes to finish plucking
- If you decide not to harvest your flock: they will lay well for 1 year, and so-so for 2 more; there are charities that accept your older hens that will allow them to live out the rest of their lives – commercially selling hens is not an option without a license



Feathers

- Poultry and fowls have two kinds of feathers; downs and quills
- Wash and sanitize (5% bleach solution) the feathers just like doing dishes by hand, let dry thoroughly and sort – quills are good for craft projects and such, downs are good for insulation and bedding
- When Plymouth Bay Colony was founded in 1620, many pioneers credited their survival in winter to their feather beds and quilts; the feathers are contained in a type of cloth called ticking (very thick threads and dense weaving with good flexibility) and sewn into second linen or cotton lining, followed by a removable pillowcase



Carrier and Racing Pigeons

- Vital for communications until the 1950's, carrier pigeons were the fastest method of transporting secure messages, photo negatives, and occasionally medical supplies
- Today they're more of a novelty and sport; provides an alternative communication means along with meat (from unneeded offspring) and fertilizer
- Be sure to have some means of identifying the bird; wing stamps and leg tags
- To train: pick a good bird with excellent eyes and wings, place in a cage that it can easily see it's surroundings (very important the bird sees where it goes), and take the bird out to a nearby area 100 ft. away and release; if the bird comes back to it's roost wait a couple days and take out again – doubling the previous distance each time; repeat until the bird can travel many miles back to it's roost
- Top speed for pigeons is 70 mph and carry loads up to 7 oz.



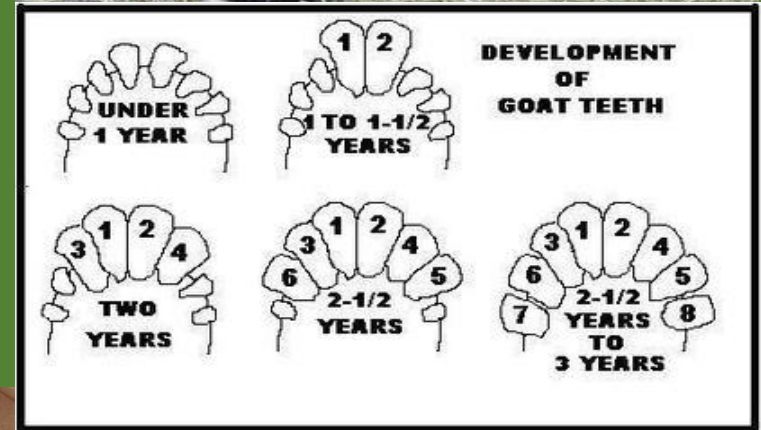
Goats

- At this time, goats are not legal in West Valley; but that may change due to economic and wartime factors
- Full-sized goats are not viable in our area without at least $\frac{1}{2}$ acre to live on due to their breeding for commercial production
- Pygmy and Dwarf goats would work for this area as their size is $\frac{1}{3}$ of the full-sized Nubian's and Saneen's; about the same as a mid-sized dog
- Pygmy goats can thrive in a barn/paddock setup and do not need a pasture
- A small dairy barn along with plenty of hay, grain, brush, shrubs, and root crops are needed



Pygmy and Dwarf Goat Facts

- Full-sized goats are not viable in our area without at least $\frac{1}{2}$ acre to live on due to their breeding for commercial production; Pygmy/Dwarf goats would work for this area as their size is $\frac{1}{3}$ of the full-sized Nubian's and Saneen's; about the same as a mid-sized dog breed
- Pygmy's thrive in a small corralled area far better than other varieties, which relies on a pasture area
- Pygmy goats give up to $\frac{1}{2}$ gallon of milk per day: the milk is better suited to humans than cows milk, healthier for people with heart conditions and better for toddlers; goat's milk has a good milk fat to butter fat ratio
- Goat meat is called "Chevon"; pygmy's and dwarfs are good for both meat and dairy uses



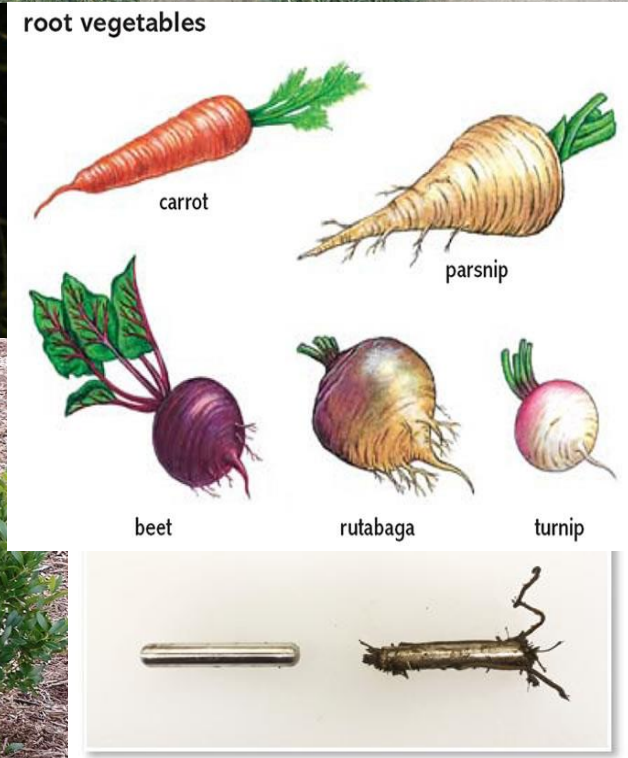
Goat Housing

- Pygmy goats are unique in that they can thrive while corralled – most goats (even dwarf's) need a large open space and pasture; pygmy's can be corralled and fed bales of hay without problems
- Pygmy's love to climb, so provide some climbing and jumping pedestals
- The housing must be tough to withstand butting and kicking without taking damage
- Goats do not like cold temperatures, so their housing must be insulated and draft free



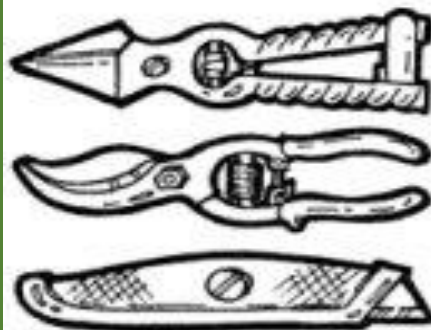
Goat Feeding

- Goats are ruminants, like rabbits; feed requirements are higher for goats than rabbits, so expect to store more rations
- Goats can eat pretty much anything a rabbit can, except they also need some shrub and brush to chew on; unlike rabbits that eat their nighttime feces, goats get their protein directly from their food, so feed more alfalfa and root crops
- Unlike cartoons, goats will not eat just anything laying around – they do test things by chewing on them, but can accidentally eat a piece of metal; if this happens they will show signs of “Hardware Sickness”, so force feed a magnet to the goat which will stay in the first stomach for their entire life, but will save their life



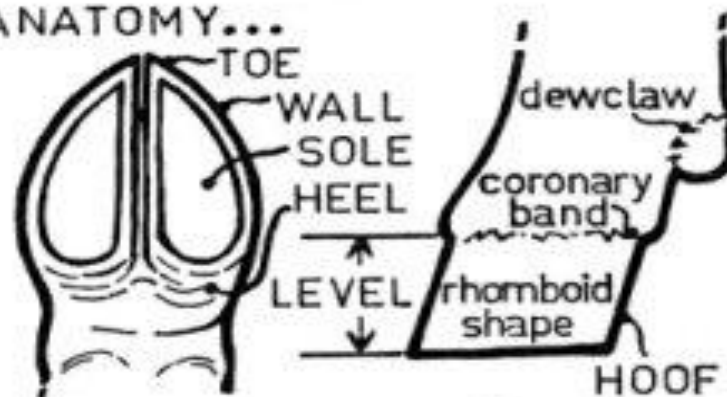
HOOF TRIMMING.....

TOOLS...



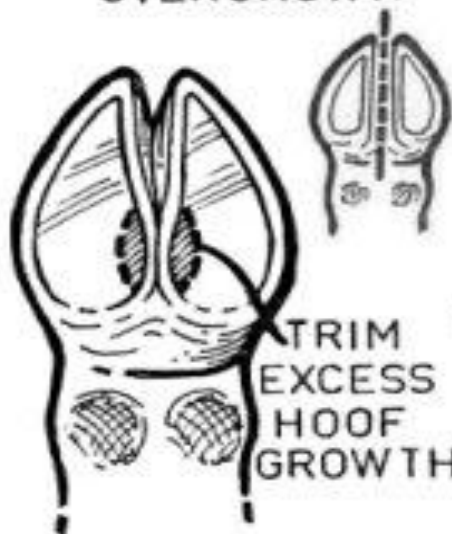
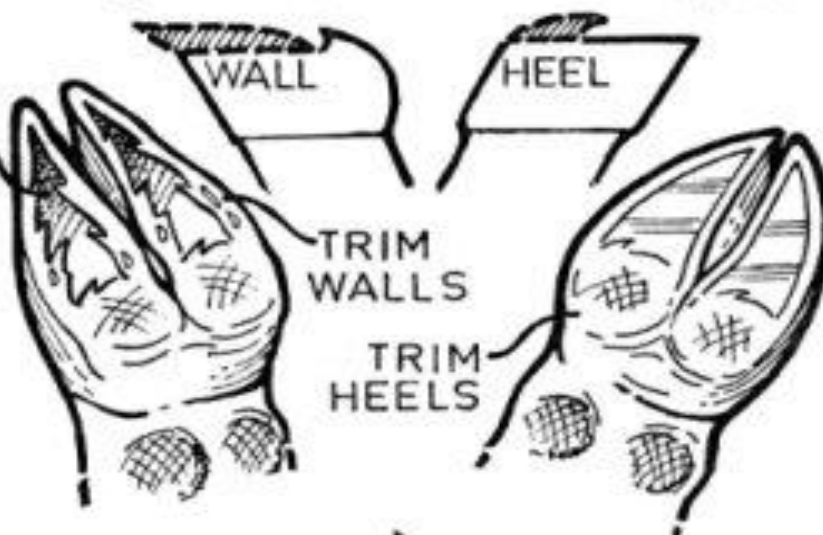
foot rot
shears
or
pruning
shears
and
utility
knife

ANATOMY...



OVERGROWN

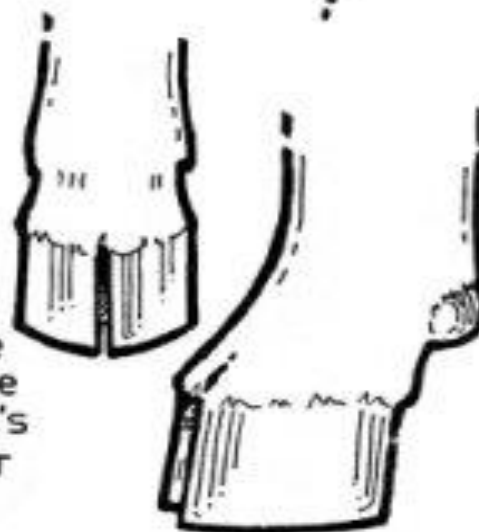
DIG
OUT
DIRT



if the hoofs
are trimmed
regularly
the job is
much easier



if the goat
bleeds use some
iodine and make
sure the animal's
tetanus booster
is up to date



PROPER TRIM

Goat Breeding

- Would be difficult to keep a ram in a residential area; will probably need to arrange for your nannies to be serviced by a larger herd's ram, or order in frozen seed and insert by syringe (Artificial Insemination)
- At the first sign of heat in the nanny, take her to the ram as soon as possible, or order in the frozen seed when anticipating heat; thaw and inject; if uncomfortable doing this for your goats, then consult a veterinarian to perform the task for you
- Gestation (pregnancy) takes 145 days; goats sometimes require assistance for delivery, and often have multiple births

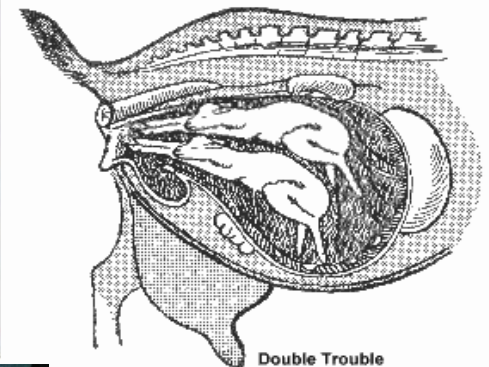
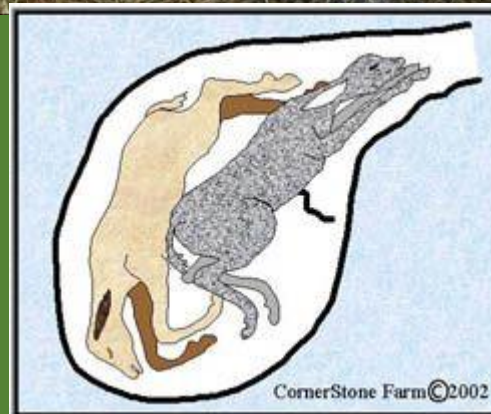
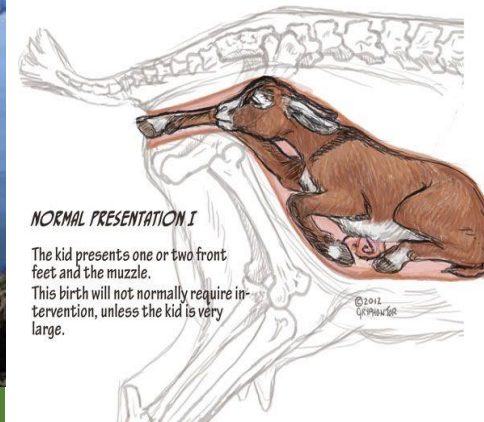


Goat Birthing

.Goats need supervision and some assistance when necessary while giving birth

.Unlike most dairy animals, multiple offspring for goats is commonplace (4 maximum); if both kid's are trying to move through the birth canal simultaneously, you must intervene by pushing one back and helping another come out first

.Only step in to help when the baby is having latching problems or the mother is in distress



Castration

- All rams kept for consumption must be castrated to avoid hormones affecting meat taste and consistency, unplanned breeding, and safety of self and flock

- Use a castration band: a specific type of rubber band that cuts off circulation to specific male parts; allowing safe removal

- If uncomfortable with castration, have a veterinarian perform the task



Dehorning

•Horn is a very useful substance – considered the plastic of medieval Europe; required soaking in water for a couple weeks to make it pliable, and was then slit open and carved; used to make spoons, cups, handles, fasteners, and cheap window panes

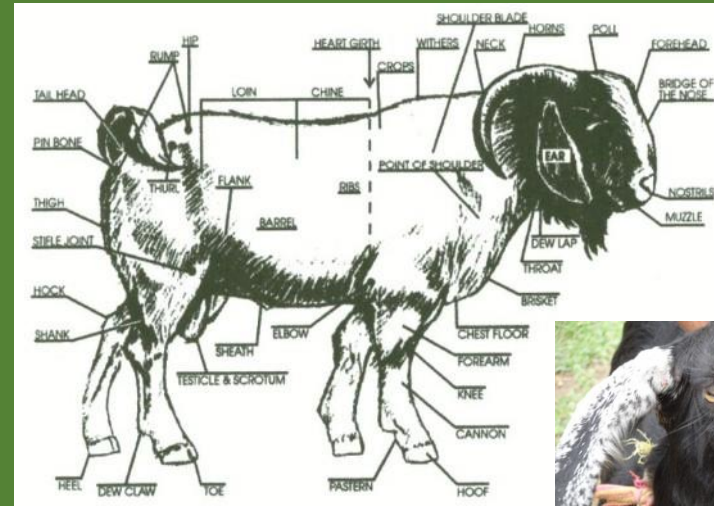
•Horns are also a hindrance to goat keepers as it can cause serious injury

•Dehorning involves using a hot knife to cut and cauterize the horn's roots so they'll never grow back – have your veterinarian teach you proper techniques



Goat Diseases

- There are five diseases goats must be tested for regularly: TB (Tuberculosis), Brucellosis, CAEV (Caprine Arthritis Encephalitis Virus), Johne's, and CL (Caseous Lymphadenitis)
- Tests are done by obtaining blood samples from all animals; newborns may not have contracted diseases due to their youth except CAEV as it's a blood born pathogen
- Utah is a Brucellosis and TB free state for goats; any animals purchased within state borders may not need testing unless declared by Utah Ag Dept.
- Parasites such as worms and fly larva (called Strike) that get in through the skin is best prevented by annually soaking the goats in a treatment solution
- Prevention is always best; keep corrals clean, feed a variety of foods, let them exercise regularly; there are many more diseases and problems that can be covered here, so be sure to study and keep up on Dept. of Ag bulletins



Milking

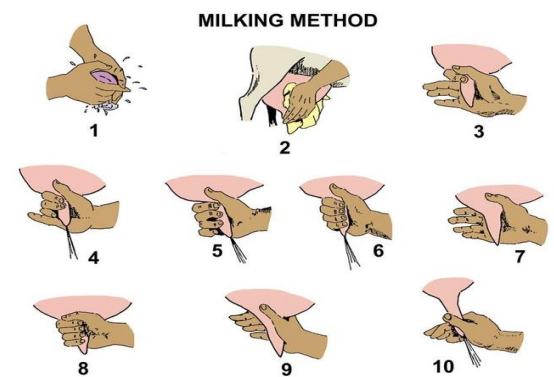
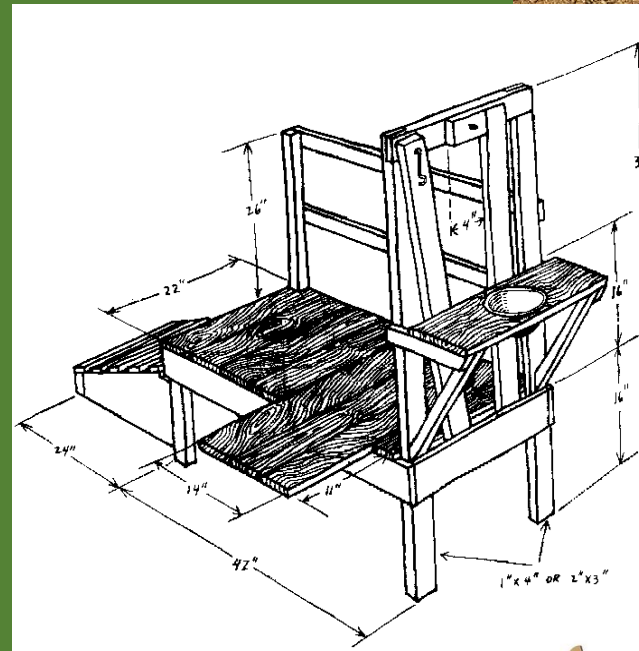
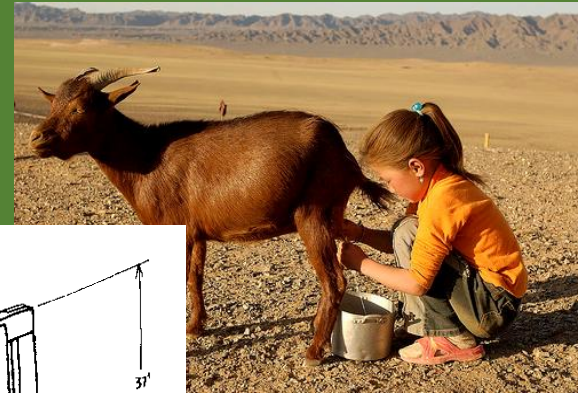
- Pygmy's and Dwarf's give up to ½ gallon of milk per day

- To milk, lead the kid away from the nanny with a treat, and then lure the nanny to a milking stand

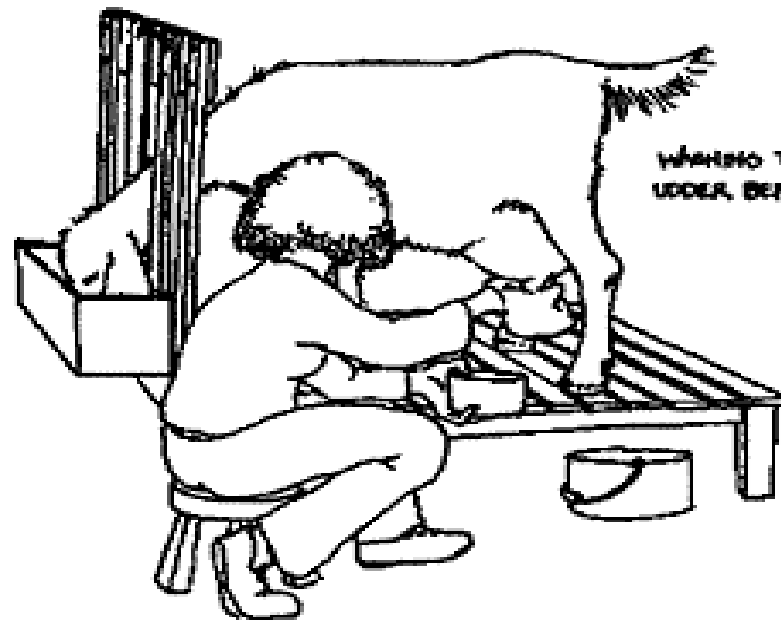
- Goats require elevated milking stands due to their ground clearance and height; make sure she's eating a treat while on the stand

- Machine milking is okay, but not practical due to cost and how little time is needed to milk a nanny

- To hand milk close first finger and thumb around the teat, push up on her milk sack, then close the other fingers in succession while allowing the teat to naturally drop – do not pull



PROPER MILKING PROCEDURES



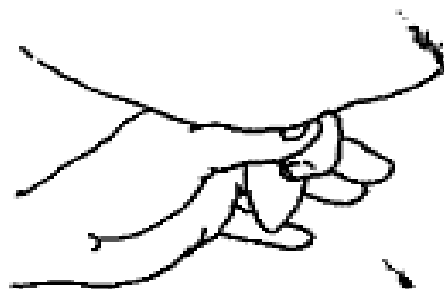
WASHING THE DOE'S
UDDER BEFORE MILKING



MASSAGING UDDER
FOR MORE MILK



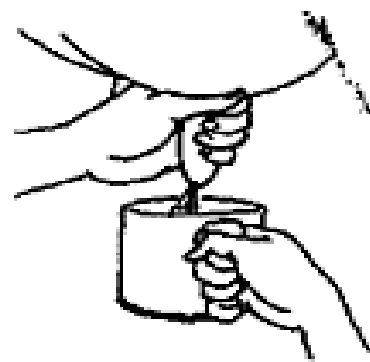
TRAPPING MILK
IN TEAT BY CLAMPING
AT TOP WITH THUMB
AND INDEX FINGER



SQUEEZING MILK DOWN
BY ADDING LOWER FINGERS
- DO NOT LOOSEN THUMB
AND INDEX FINGER -



ALL FINGERS
SQUEEZING FIRST
SQURT INTO THE
TEST CUP



DIPPING TEATS
AFTER MILKING

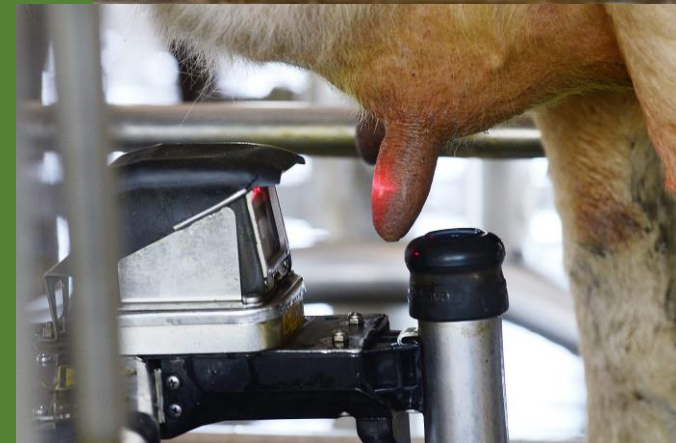


DO NOT
MILK LIKE
THIS



Automated (Robotic) Dairy

- Automated systems that care for a dairy animal's needs are becoming commonplace on commercial farms
- The entire barn is automated: feeding, cleaning, grooming, milking, pasteurizing, testing, with camera access and alerts to the farmer's smartphone
- When the dairy animal feels the tell-tell pressure in their udder, the animal was previously trained to go into the stanchion and wait while being milked – the farmer need not be present
- These systems are currently quite expensive (even for homemade) and not available right now for goats, but will be in several years



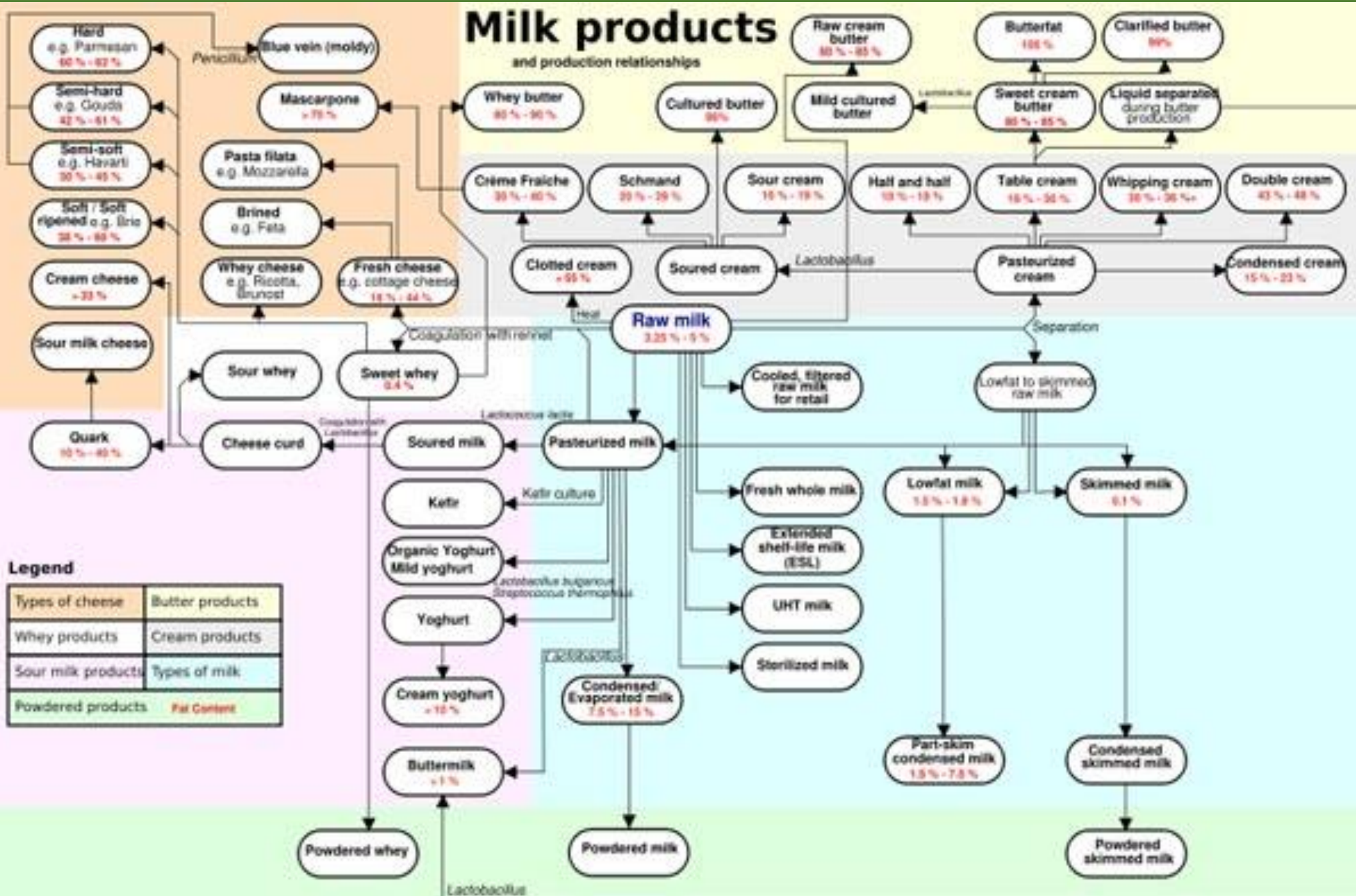
Goat Milk Products

- After milking, be sure to strain through cheesecloth or a fine strainer, followed by pasteurization, and storage
- Separate the cream from the milk by shallow pan technique or a mechanical separator
- To pasteurize: heat milk in a shallow pan to about 145° F for 30 minutes or, alternatively, heating to a higher temperature of 162° F holding for 15 seconds – remove from heat and chill rapidly
- Goat's milk is good for the same products that cows milk is good for



Milk products

and production relationships



Cream Separation

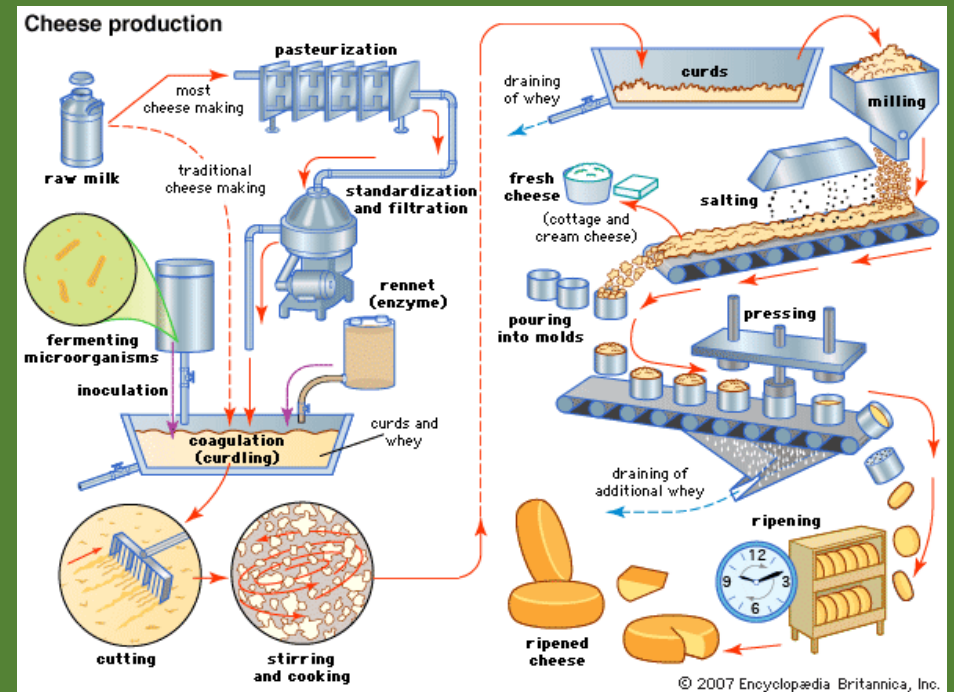
•Separating is done thorough mechanical means if there's a lot of milk to process; otherwise, leaving pasteurized milk in a jar to separate overnight is fine

•Drinking cream-infused milk is considered a delicacy in some cultures, and has a pleasant texture and flavor



Cheese Making

- Before modern agriculture and processes, cheese was the traditional method used by our ancestors to preserve excess milk for the winter as a meat substitute
- A basic recipe for goat cheese calls for 2 liters goat milk, $\frac{1}{4}$ cup vinegar, 1 tsp salt, and 3 Tbsp. heavy cream (optional); heat milk to med-high (just below boiling), add vinegar and it should separate the curds and whey (if not, heat longer or add 1 tsp more vinegar), strain through 4 layers cheesecloth or a single pillowcase, place in a bowl and mix in salt and cream, return to cloth and drain, form and use
- Whey is useful for baking, boiling instead of water in stews and soups, good for non-ruminant livestock, to water plants, or for protein shakes



Butter

• Butter is the fat globules in cream; the part that makes it so rich and flavorful

• Jar method: fill jar $\frac{1}{2}$ full of room temperature cream and seal lid; as you shake, the cream will expand and seem not to move – keep shaking anyway; the butter will appear shortly afterward; strain out liquid and rinse off butter under cold water and work it – repeat until rinse water comes out clean; salt if desired and store

• The liquid strained from the butter is buttermilk; save and use



Divide cream into jars



No more than half full



Shake until solids appear



Strain and rinse



Work butter



Finished yummy butter

Yogurt

•Yogurt is made with 4 different bacterial colonies to ferment the lactose into lactic acid

•Thermos method: combine 2 quarts warm milk (100°F) to 6 oz. Plain yogurt, add 1 cup dry milk and mix thoroughly – leave overnight with lid on; in the morning, place in new container and refrigerate

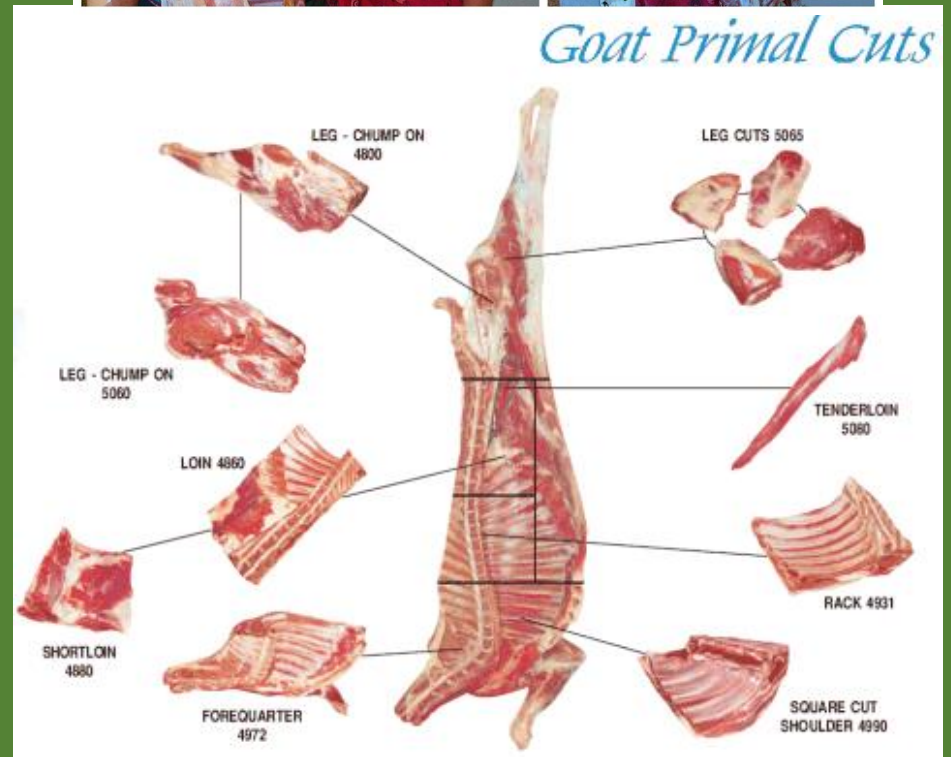
•Crockpot method: turn crock pot to low and pour in ½ gallon of milk; heat on low for 2½ hours then turn the crock pot off; cool the milk in the crock with the lid on for 3 hours; after 3 hours, stir in 6 oz. of plain yogurt (set out earlier to reach room temperature); place the cover back on the crock, remove from the heating element, and wrap the entire crock pot in a thick bath towel or two; culture 8-12 hours or overnight in the oven (no heat); after the culturing period, store in glass jars in refrigerator - for optimum texture, refrigerate for at least 6 hours before using

•Add the same bacteria in cream to create sour cream



Harvesting Goats

- Study online how to harvest goats in the most humane and efficient ways possible and legal for our area (no firearms)
- Harvest in a shed or garage, away from public view; be sure to dispose of all blood and entrails appropriately so there's no trace left; be warned – goat bleed heavily and more watery than rabbits and fowls
- To harvest: hold the goat on it's lateral side and quickly thrust a knife into it's two jugular veins and allow the animal to exsanguinate; it will kick and spasm, so it's best to do this with more than two people to hold it in place; hang with hooks between the hocks and Achilles tendons and remove the skin by cutting it free
- Goats provide red meat (called Chevon) with a lower fat content than beef; definitely a great meat nutritionally, very similar to lamb - can taste gamey compared to beef; works great cooked like mutton, but needs tenderizing and scoring when cooked like beef or lamb – excellent in a slow cooker; Chevon has lots of braising cuts and not so many Prime and Choice cuts

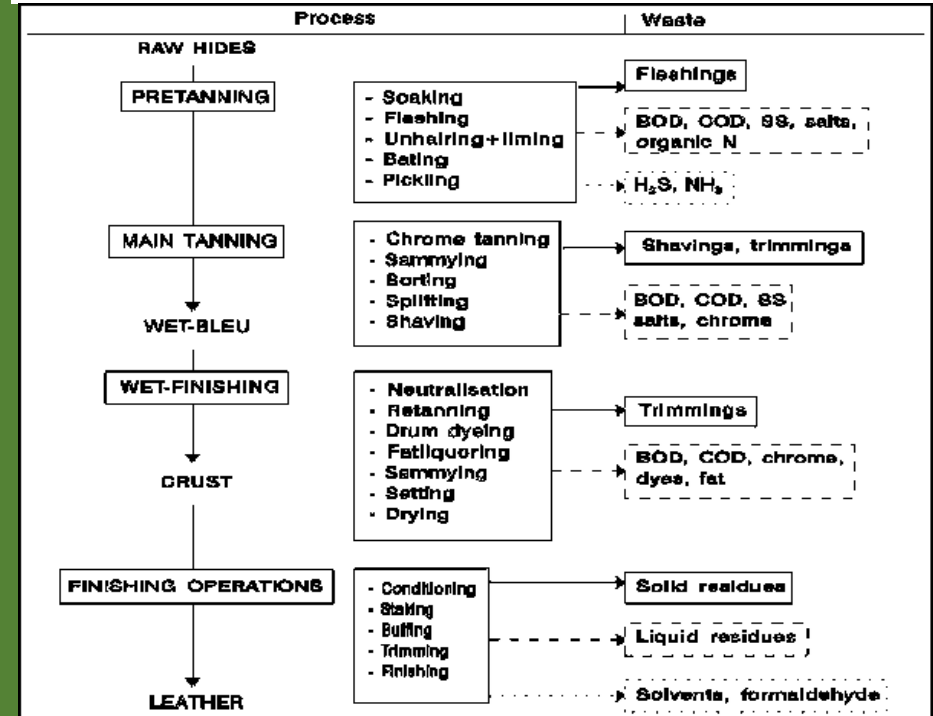
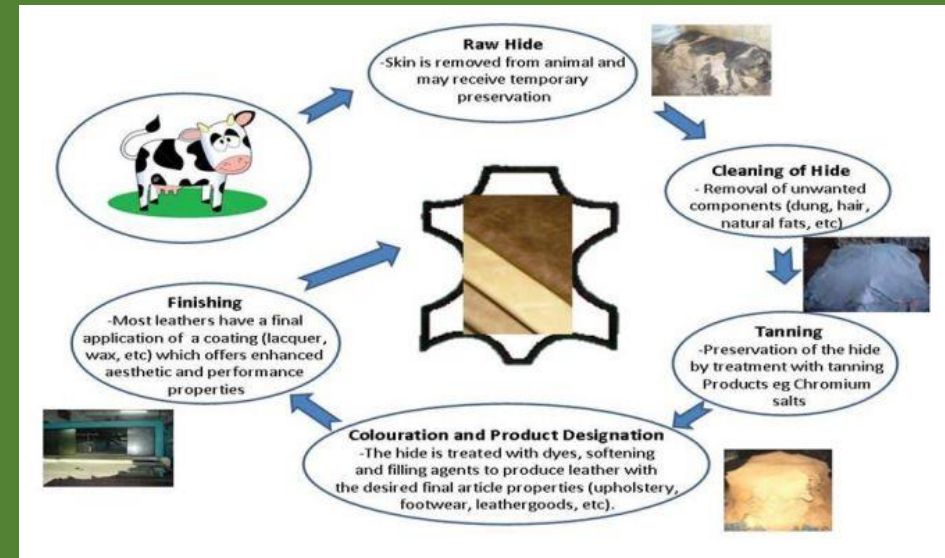


Curing or Tanning Hides

• Rabbits and goats provide hides (skins) as a by-product of meat harvesting; processed into leather, furs, rawhide, glues, and other products; there's two ways of processing: salt curing and tanning

• To salt cure: Add one cup laundry detergent to a bucket of warm water and hand wash hides; nail each hide fur side down to a board with small nails (heads protruding for easier removal); coat with a thick layer of non-iodized salt – it's not necessary salt it, but if you don't have time right then the hide will keep for a few days; brush off salt and scrape off all the subcutaneous layer (this can be time consuming); brush on a tanning solution, or use brains, egg yolks, coffee grounds, whatever you have just cover all the skin and not the fur; After applying tanner, cover the skins completely with a single cloth soaked in borax and let it rest overnight; remove from the board and wash again in detergent; after washing and while still wet, work the hide by pulling it over a curved board to make it pliant and bendable – this step is necessary or the pelt will stiffen and be brittle; sew up any holes and use for craft projects

• There are dozens of ways to process hides; research and try what works best for you



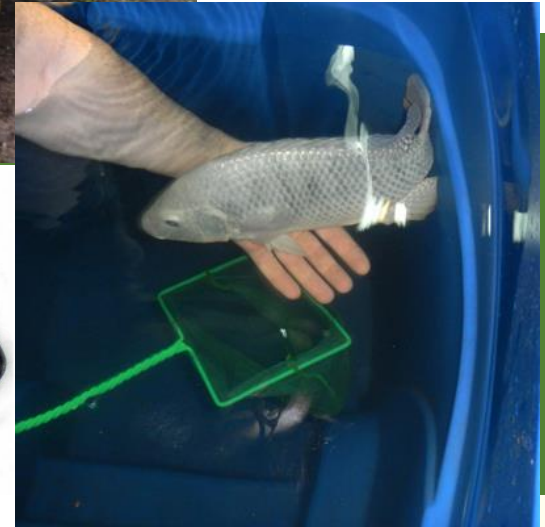
Aquaculture

- A relatively new approach to urban areas, raising fish is economical with the right set-up and breeds, but it does require licensing for non-commercial

- Tilapia, Bluegill, and Carp are the most prolific as they can thrive on algae and vegetation, are hardy, and have a good return on investment in meat and liquid fertilizer; this primer will focus on a triad of Bluegill, Trout, and Catfish

- Requires an initial large investment in tanks, a pond, and equipment

- New method of aquaponics includes raising and breeding your own fish and fertilizing the plants with the waste: two age staggered groups of fish are raised in separate 55-70 gallon tanks, all eggs are massaged from the females for caviar, a selection of 3-9 fish are bred artificially, fish are gradually harvested for meat at different sizes, and the cycle continues



Legalities

- The State of Utah now requires all fishing ponds (commercial, public, and non-commercial private) to be licensed; basically, the same set up as with honeybees
- The State requires: ensure the aquaculture product is delivered to the pond by a licensed aquaculture facility; accept only the exact species (including strain and reproductive ability) authorized for stocking in the pond; all private pond owners possessing a current Certificate of Registration (COR) within the guidelines of the previous private pond rule may operate within the stipulations of that COR until it naturally expires
- Application fee is currently \$10, but there may be a \$100 risk assessment fee that the division could require

<https://wildlife.utah.gov/private-ponds.html>

APPLICATION CERTIFICATE OF REGISTRATION (COR) PRIVATE FISH POND (R657-59)		<div style="border: 1px solid black; padding: 2px; display: inline-block;">Clear Form</div>
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Initial Application ☐ Amendment ☐ Renewal ☐

Amendments or Renewals Please Provide Existing COR Number:

APPLICANT INFORMATION

Responsible Person: <input style="width: 150px;" type="text"/>	Date of Birth: <input style="width: 100px;" type="text"/>
Company: <input style="width: 150px;" type="text"/>	Cell Number: <input style="width: 100px;" type="text"/>
Address: <input style="width: 150px;" type="text"/>	Other Number: <input style="width: 100px;" type="text"/>
City, State, Zip: <input style="width: 150px;" type="text"/>	Email Address: <input style="width: 100px;" type="text"/>

POND INFORMATION

<i>Location of Pond</i> <small>(this information is available through the county recorder's office)</small>	<i>Description of Holding Facilities</i>
Is pond located at address above? Yes <input type="checkbox"/> No <input type="checkbox"/> <i>If no, please provide the following information:</i> County: <input style="width: 100px;" type="text"/> UTM coordinates or latitude & longitude: <input style="height: 20px;" type="text"/> <div style="text-align: center;">Water Information</div> Water source: <input style="width: 100px;" type="text"/> Quantity of water in gpm: <input style="width: 100px;" type="text"/>	Pond size: <input style="width: 100px;" type="text"/> Elevation: <input style="width: 100px;" type="text"/> Depth: <input style="width: 100px;" type="text"/> Is this a newly constructed pond? Yes <input type="checkbox"/> No <input type="checkbox"/> Is pond on a natural stream channel? Yes <input type="checkbox"/> No <input type="checkbox"/> Are permanent screens installed in the inlet? Yes <input type="checkbox"/> No <input type="checkbox"/> Are permanent screens installed in the outlet? Yes <input type="checkbox"/> No <input type="checkbox"/> If there is currently a COR issued for this pond, has the pond been remodeled or substantially changed since the issuance of the last COR? Yes <input type="checkbox"/> No <input type="checkbox"/> Are fish present? Yes <input type="checkbox"/> No <input type="checkbox"/> If so, what kind? <input style="width: 100px;" type="text"/>

NAME(S) OF SPECIES REQUESTED

1) <input style="width: 100px;" type="text"/>	6) <input style="width: 100px;" type="text"/>	11) <input style="width: 100px;" type="text"/>
2) <input style="width: 100px;" type="text"/>	7) <input style="width: 100px;" type="text"/>	12) <input style="width: 100px;" type="text"/>
3) <input style="width: 100px;" type="text"/>	8) <input style="width: 100px;" type="text"/>	13) <input style="width: 100px;" type="text"/>
4) <input style="width: 100px;" type="text"/>	9) <input style="width: 100px;" type="text"/>	14) <input style="width: 100px;" type="text"/>
5) <input style="width: 100px;" type="text"/>	10) <input style="width: 100px;" type="text"/>	15) <input style="width: 100px;" type="text"/>

Other species if not listed above:

I hereby certify that I have read and am familiar with the rules pertaining to the activity(ies) applied for and that I accept any and all liability resulting from the issuance of a certificate of registration. I further certify the information submitted in this application for a COR is complete and accurate to the best of my knowledge and belief. I understand that any false statement herein may result in the application being denied.

Applicant Signature _____ Date _____

Division of Wildlife Resources – 1594 West North Temple, Salt Lake City, UT 84114 – (801) 538-4701

AL OFFICES

Private pond is located

is, Morgan, Rich, Summit, &

Uintah

te, Tooele, Utah, & Wasatch

Kane, Millard, Piute, Sevier,

, & San Juan

s covering live possession of
 y be in effect. If local laws
 permission from the local
 this application for a COR.
 PRIOR TO SUBMITTING A

& Wildlife or U.S. Department
 it or a copy of your

f \$10, which is a
 ce to pay with credit card.

prior to processing.

FISH HEALTH APPROVED HATCHERIES: Utah Facilities, Out-Of-State Facilities and Utah Brokers

Note: Fish stocked into private ponds, aquaponics systems, aquaculture facilities and fee fishing facilities must come from Health Approved Sources. A Certificate of Registration (COR) is required to obtain most aquaculture products. The following list is subject to periodic change. **If you have any questions, contact UDAF at 801.982.2246.**

EFFECTIVE March 2020

FISH HEALTH APPROVED & LICENSED AQUACULTURE FACILITIES IN UTAH

Name	City	Phone	Species (& expiration date)
Christensen Catfish	Newcastle	435-691-4584	Hybrid striped bass (April 2021).
Cold Springs Trout Farm	N. Ogden	801-782-7282	Sterile and fertile rainbow, brown, and brook trout; tiger trout, hybrid striped bass (January 2021)
Cove River Ranch	Richfield	801-541-6719	Specializes in catchable sterile rainbow trout (June 2020)
Spring Lake Trout Farm	Payson	801-369-7177	Sterile and fertile rainbow trout, cutthroat trout, cutbow (July 2020)
Sunfish Fish Farms	Beaver	801-376-3571	Bluegill, hybrid bluegill (L. macrochirus x L. cyanellus), crappie, redear sunfish' largemouth bass, catfish, fathead minnow. (September 2020)
Water and Environmental Testing	American Fork	801-763-0660	Fathead minnows (February 2021)

FISH HEALTH APPROVED AQUACULTURE FACILITIES OUT-OF-STATE

Name	State	Phone	Species (& expiration date)
Black Canyon Trout Farm	Idaho	208-425-3239	Sterile and fertile rainbow trout, Snake River cutthroat (November 2020)
Hopper Stephens	Arkansas	501-676-2435	Black crappie, bluegill, channel catfish, green sunfish, hybrid bluegill, largemouth bass, redear sunfish, triploid grass carp (December 2020)
Keo Fish Farms	Arkansas	501-842-2872	bluegill, hybrid striped bass (wiper), striped bass, triploid grass carp, white bass (December 2020)
Osage Catfisheries Inc	Missouri	573-348-2305	Black crappie, bluegill, channel catfish, fathead minnows, hybrid bluegill, largemouth bass, redear sunfish (December 2020)
Troutlodge Inc.	Washington	253-863-0446	Sterile and fertile rainbow trout eggs (steelhead) (February 2021)
Wright's Rainbows	Idaho	208-547-7452	Sterile rainbow trout (March 2021)

LICENSED BROKERS IN UTAH

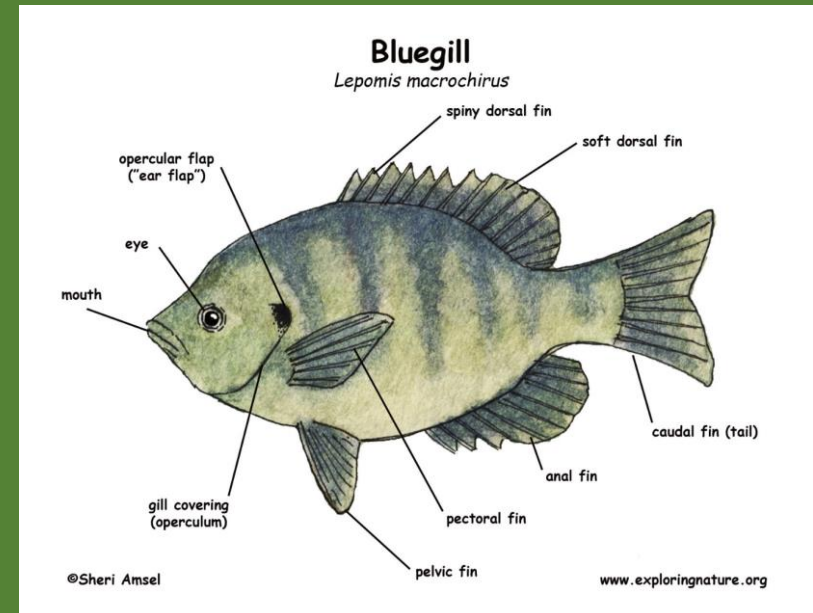
Name	City	Phone
Cold Springs Trout Farm	N. Ogden	801-710-4905
Spring Lake Trout Farm	Payson	801-369-7177
Sunfish Fish Farms	Beaver	801-376-3571

COMMERCIAL FOOD PRODUCERS

Name	City	Phone	Specialties
Mountain Valley Trout Farm	Smithfield	435-563-3647	Trout
Mountain View Trout Farm	Brigham City	435-730-1723	Trout
Spring Lake Trout Farm	Payson	801-369-7177	Trout
Trout of Paradise	Paradise	435-245-3053	Trout

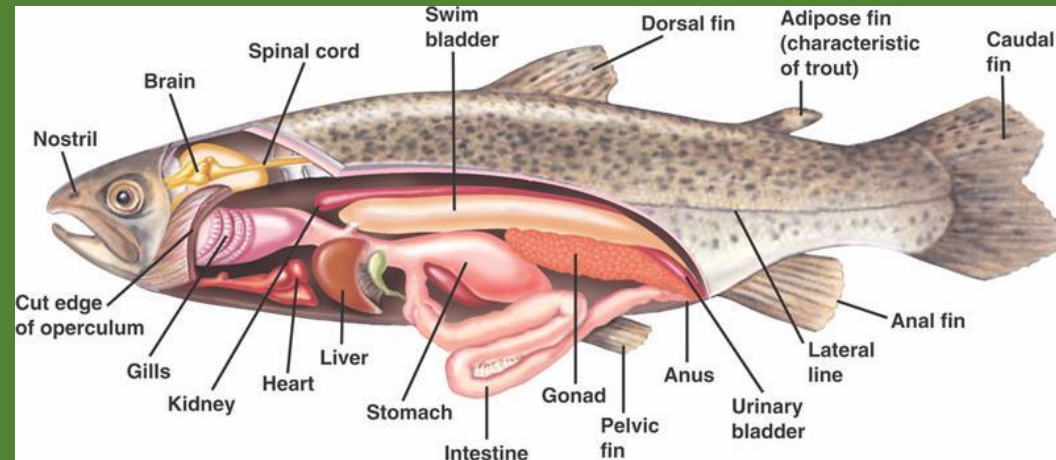
Raising Bluegill

- Bluegill are the best fish to raise in an urban environment
- Prolific omnivore feeders; mostly on algae, insect larvae, and plankton – balanced feed is available on the market but it's much cheaper to make your own
- Entire set up can take about 40 sq feet of yard space all the way down to a single 55 gallon barrel on a sunny patio
- In a pond, bluegills stay on the upper half while the predatory trout are below them; the trout hunt and feed on the bluegill, while the crumbs and remaining carcass falls to the bottom and feeds the catfish



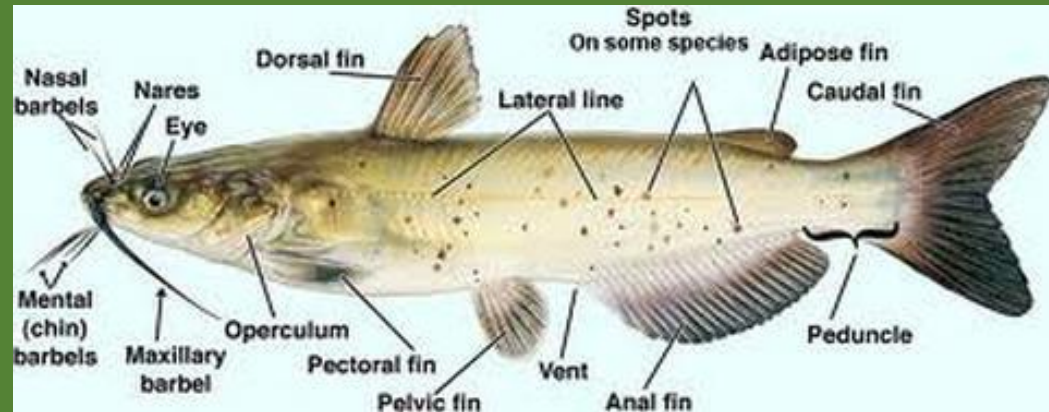
Raising Rainbow Trout

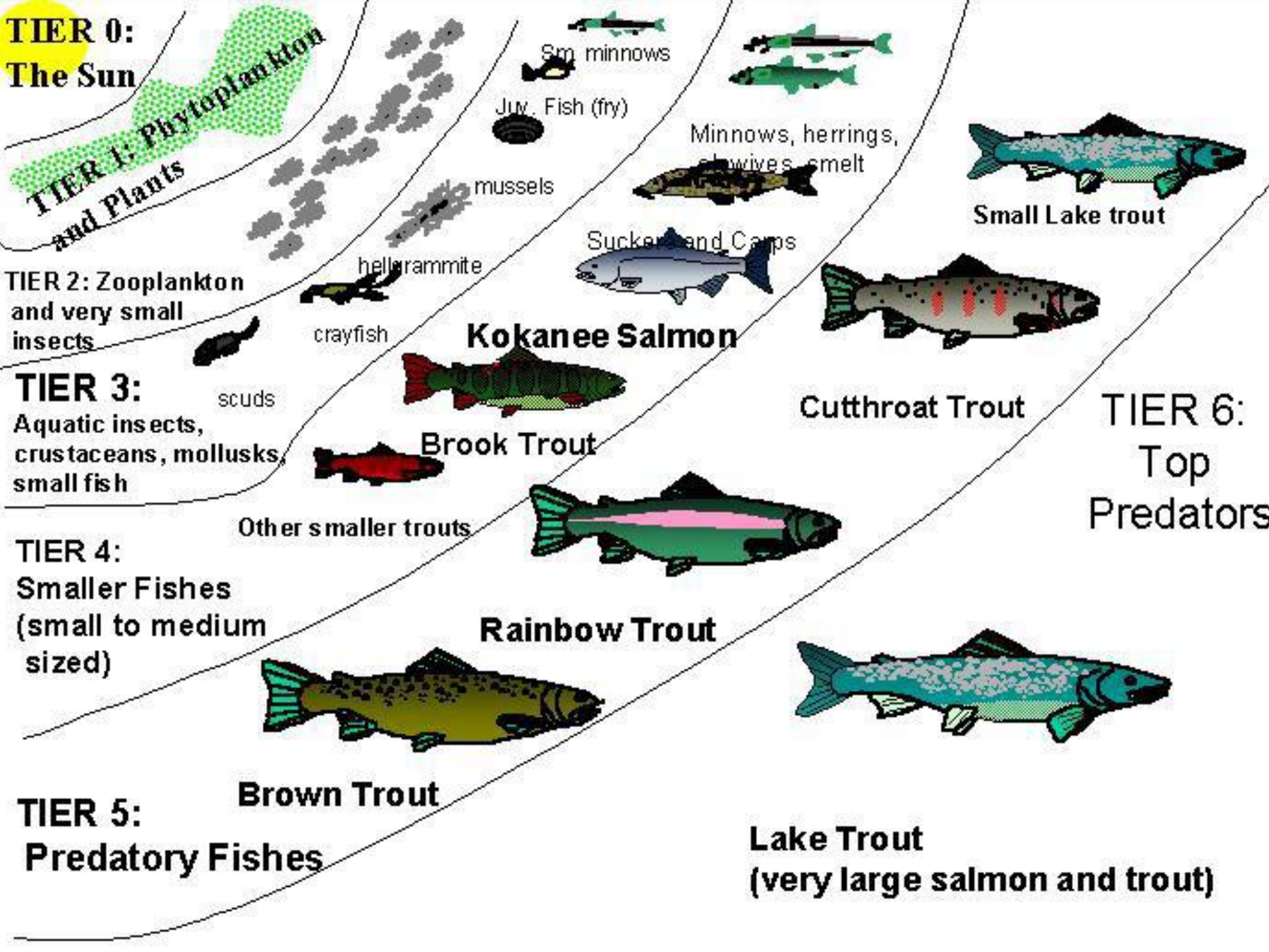
- Rainbow Trout are carnivorous fish that feed mainly on the bluegills and anything else in the lower half of the pond
- Trout live in temperatures of 32° - 80° F with constant water circulation
- Spawning occurs in temperatures of 48° - 57° F, but trout rarely do this in tanks and small ponds, so you'll need to practice some husbandry and withdraw the eggs and seed from the fish yourself
- “In the wild, adult trout feed on aquatic and terrestrial insects, molluscs, crustaceans, fish eggs, minnows and other small fishes, but the most important food is freshwater shrimp, containing the carotenoid pigments responsible for the orange-pink colour in the flesh. In aquaculture, the inclusion of the synthetic pigments astaxanthin and canthaxanthin in aquafeeds causes this pink colouration to be produced (where desired).”
[h/t thefishsite.com](http://thefishsite.com)



Raising Catfish

- Catfish are bottom feeders and opportunistic omnivores; will eat anything available – plant or animal based
- They require continuously flowing water and same temperatures similar to trout's, but warmer waters like 78° - 86° F is optimal and will encourage faster growth
- Adults spawn at 2-3 years of age and eggs usually placed in a sheltered area (like under a rock outcropping or under a log); females release between 6600-8000 eggs
- Channel catfish and their associated species are known to grow to enormous sizes – be sure to follow through with all harvesting dates





Fish Pond or Tanks

- Dig a pond at least 4.5 feet deep by 12 feet square: ponds that are less than 2.5 feet deep can both cool down and heat up quickly, which makes for unnecessary temperature fluctuations; install a pump and filter in the pond – the filtered material is great fertilizer

- An aerator for non-freeze seasons will return oxygen to the water: fish don't actually breathe water, they breathe the air mixed into the water

- Tanks are best installed indoors in a shed; treat similar to a large aquarium; install a heater for the winter and an aerator for the year round

- If outdoors you must treat for mosquito larva every year without missing any treatments

- Both must be inspected and approved prior to use



Fish in a Barrel System

•Choose a large barrel or drum that is no less than three-fourths of a meter deep, with a large surface area (55 gal water drum with the top cut off or 70 gal trash can will do). Add rocks and gravel as well as floating and submerged plants if desired; buy and install a small pond heater and aerator/filter. Fill your barrel with water and give it one week to dechlorinate and settle

•Choose a site for your drum which receives adequate sunlight for algae growth, or shady for predatory fish (trout, catfish, bass). For Tilapia, Bluegill, or Carp: add a small shovel-full of natural manure and algae starter to your barrel. Chicken manure works well. These fish thrive on aquatic bugs, algae and plants fed by high-nutrient loads.

•Stock your barrel with 100 fingerlings in a shallow wire basket near the surface. As they grow bigger lower the basket to create more space; remove when fish are about 2 inches (The number of fish you can stock will depend on the size of your barrel, but 100 fingerlings is a good number for a single family).

•Feed fish daily as many pellets as they can eat in 5-10 minutes. Use appropriate pellets for their age/weight. Keep an eye on the pump, filter, and aerator; the fish are always edible and consumable at all sizes (4 inch fish or bigger makes good canned sardines) but always have a couple males and a few females to breed the next batch

•Keep most of the eggs for caviar and fertilize at least 100; place the eggs in a shallow tank with (constantly moving, filtered water) indoors and out of sunlight to hatch and finish consuming remaining fish; clean the barrel, add new water, and start the cycle again.

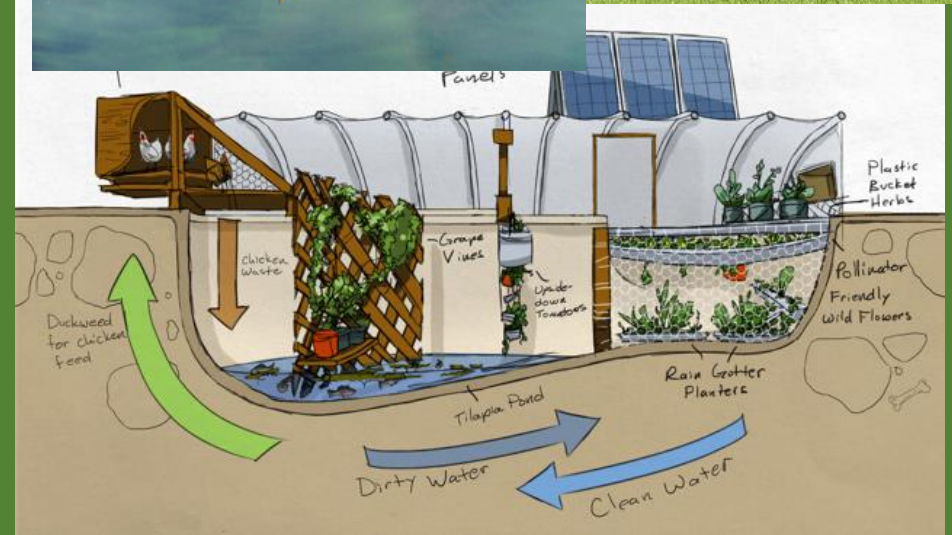


Feeding Fish

•Bluegill, particularly young ones, that have access to food on an ongoing basis throughout the day grow considerably quicker than those that are only fed once or twice per day; Bluegill cultured in ponds will also feed on naturally occurring food, such as insect larvae and algae

•Build a rabbit hutch or chicken coop overhanging the pond and seed the water with plankton and algae – the manure falling into the pond will increase their natural production, on which the bluegill will feed

•If growing only trout or catfish, feed moderate amounts twice a day; trout needs a specific diet and commercial feed is best; catfish will eat anything they can get their mouths on – even dinner leftovers



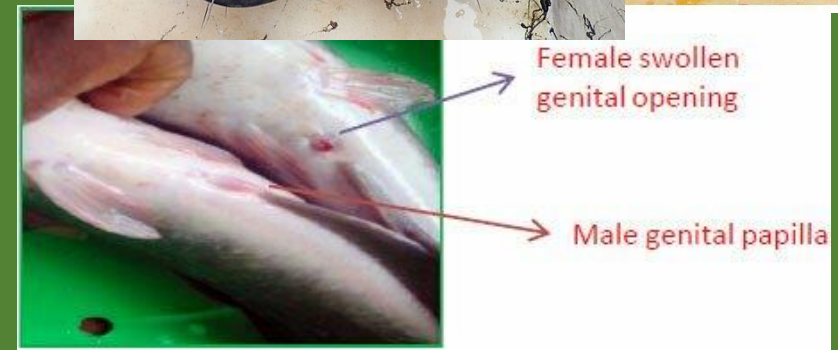
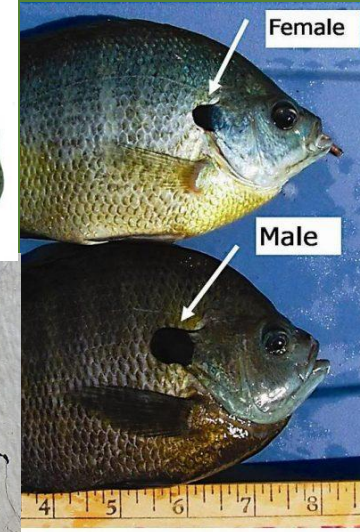
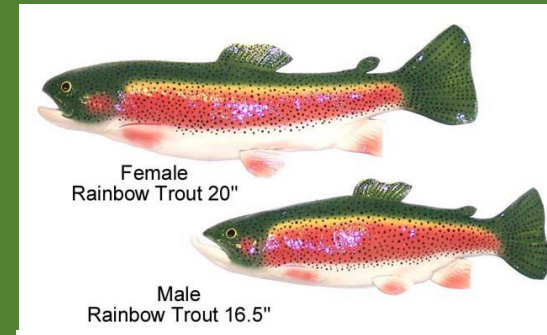
Breeding Fish

.Bluegill in the wild are low on the food chain; to compensate, they can have over 80,000 offspring in one go; Trout and Catfish, not so many

.Bluegill and catfish breeding sets of 1 male and 3-16 females is adequate; place them in a separate, large indoor aquarium with something big enough for the females to hide in – ensure the water is the same temperature and chemistry as the outside pond to avoid shock

.Trout will need you perform the task; find a female ready to release her eggs and gently massage the lower abdomen to get her to release into a colander – lower the eggs into water 48° - 57° F; next, do the same for the male fish so he'll release his seed directly into the wet colander; wait a few hours and then begin filtering the water; wait until the eggs hatch and feed newborns in a couple days when the yolk sack is depleted

.Catfish may spawn in the production tank with the right conditions; when the eggs appear, leave them in the water and monitor their progress; feed right after hatching



Freshwater Caviar

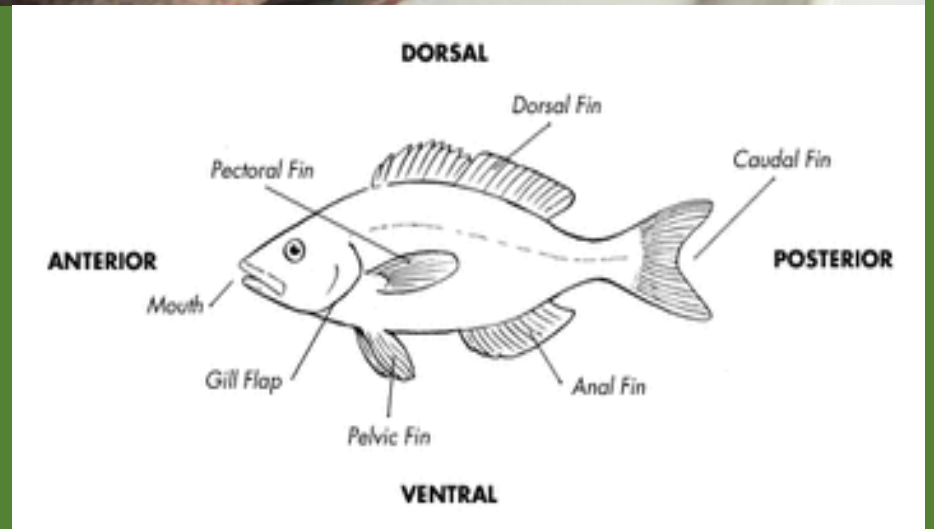
- All fish eggs are good for eating, though Beluga Caviar from the Black Sea is the most popular
- Bluegills (top silver eggs), trout (middle, dark orange eggs) and Catfish (bottom, light orange eggs) will work
- To make Caviar if the eggs are from a fish that's not ready to spawn: remove the egg sacks from the female, these will be inside membranes; cut open the membranes and remove the eggs from the veins and arteries (this will be the most difficult part); rinse the eggs a few times in fresh water to remove all broken eggs and membrane pieces
- If the female is ready to spawn: hold the female and gently massage the lower abdomen to get her to release the eggs into a colander
- Weigh the eggs and add $1/10^{\text{th}}$ the weight in salt, mix in gently – salt will permeate in a few hours; caviar will last 4-5 days in the fridge, or can it in a pressure canner for long-term storage



Harvesting Fish

•Sequester or move the fish that are to be harvested to a container of fresh water for a few days prior to harvest: the separation allows the fish time to purge themselves of any dirt and detritus they have ingested

•Quickest way to dispatch is to grab firmly with the left hand and place two fingers of the right hand into both gill slits; pull back the head hard but firmly until the neck breaks and the main artery severs



Cleaning and Fileting

- Rinse the fish under cool water to remove any debris that may be on the fish
- Lay down on its side on a flat surface covered with newspaper
- Use a sharp, flexible knife to slice the head away from the body beneath the gills
- Twist the head to remove it from the body after the slice
- Insert the knife into the body of the fish at the vent and slice along the belly. Remove the entrails
- Save the head for soup stock, or gather the head, entrails and skeleton, if fileted, and dispose of in the trash or compost
- Cook fresh, clean the fish as soon as possible, or freeze immediately for cooking later
- Filet the fish, if desired: insert your knife on one side of the backbone and slice the meat away from the rib bones from the top of the fish to the tail - clean and processed as soon as possible after the catch for fresh fish flavor



Filleting and Skinning a Fish

Large fish such as Salmon, Steelhead and big trout or fish with large plentiful scales, such as bass and

panfish, are easier to cook if they have been filleted and skinned first.

1. Lay the fish on its side on a flat surface. Cut the fish behind its gills and pectoral fin down to, but not through, the backbone.



2. Without removing the knife, turn the blade and cut through the ribs toward the tail. Use the fish's backbone to guide you.



Turn fish around and finish cutting fillet away from the backbone.



3. Turn the fish over and repeat on the other side.



4. Remove rib cage after the fillet is cut.



5. To skin the fish place it skin side down on a flat surface, insert the knife blade about a 1/2 inch from the tail. Grip the tail firmly and run the knife blade at an angle between the skin and the meat.

Honeybees

- Honeybees are legal to keep in backyards... for now
- Does require inspection by the State of Utah as honeybees come in contact with worker bees from agricultural hives; bee inspectors are available to assist Utah's beekeepers, although not all counties employ an inspector, you are welcome to contact them if you have questions or concerns about beekeeping, or contact UDAF Insect Programs at (801) 538-4912 or online

<https://ag.utah.gov/farmers/plants-industry/apiary-inspection-and-beekeeping/>


- Beehives require licensing by the State: cost is \$10 per year for 1- 20 hives; beehive owners can request information, contacts, and inspections free of charge after paying for the license



Legalities

- All honeybee hives require registration with the State of Utah's Dept. of Agriculture
- The reason is that non-commercial and commercial bees will socialize and share drones for reproduction regardless of legal and corporate distinctions
- Go online and register; it's \$10 per year for 1 – 20 hives; this fee includes inspection service and advice, plus assistance for disease and any statewide problems
- Failure to register is a violation of State Law and carries penalties

<http://ag.utah.gov/plants-pests/beekeeping.html>



UTAH DEPARTMENT OF AGRICULTURE AND FOOD
950 N. Redwood Road
P.O. Box 146500
Salt Lake City, UT 84114-6500
(801) 538-7184 Information (801) 538-7189 FAX

APPLICATION FOR BEEKEEPER LICENSE (1201)
1 to 20 Hives Fee \$10.00
21 to 100 Hives Fee \$25.00
101 to 500 Hives Fee \$50.00

In compliance with provisions of the Utah Bee Inspection Act passed by the 1979 Legislature, I hereby apply for a Beekeeper's Registration for the year . Enclosed is a payment of the registration fee in the amount of \$.

Name

Address

Phone Email

Number of Bee Colonies:

Location of Bee Colonies:

Signature of Applicant Date

Please make check or money order payable to Utah Department of Agriculture and Food.

OFFICE USE ONLY

Approved By Date

Types of Bees

• Three types of bees exist in a hive: workers, queens, and drones

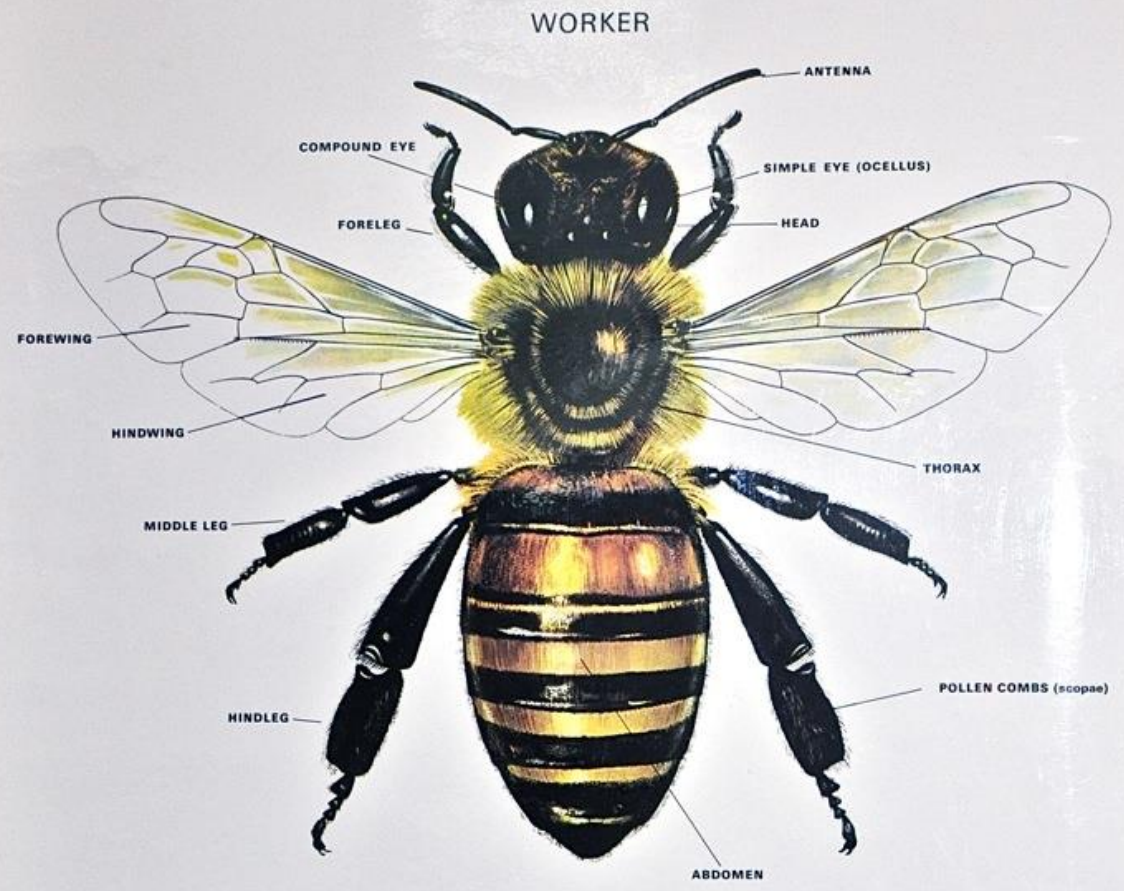
• Workers are sterile females; they do all the labor of creating combs, gathering foods, nursing young, and fighting off threats

• Queens are worker larvae fed a special food called Royal Jelly to turn them into a queen: the queen's only job is to be mated with a drone and lay eggs; each hive has only one queen and she will kill any competing queens unless the hive is preparing to swarm

• Drones are stingless males that have only one purpose - mate with a queen: an unfertilized queen will take flight and send out pheromones attracting drones from other hives to come and mate with her; one (un)lucky drone will mate with the queen mid-flight and die in the process, the rest of the drones are kicked out after the queen's mated

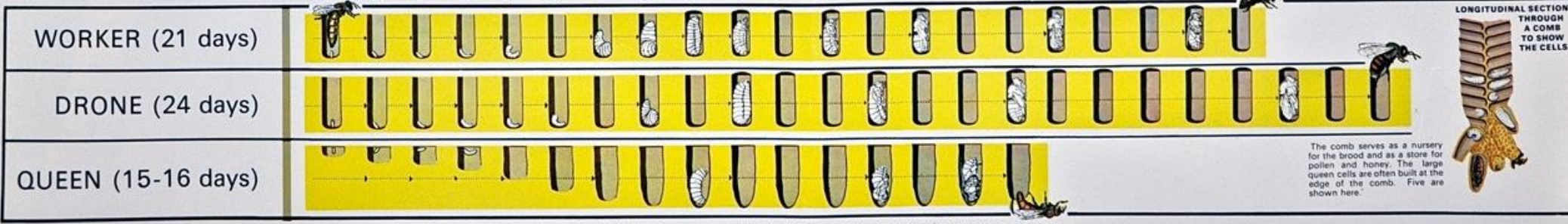


THE HONEYBEE (APIS MELLIFERA)

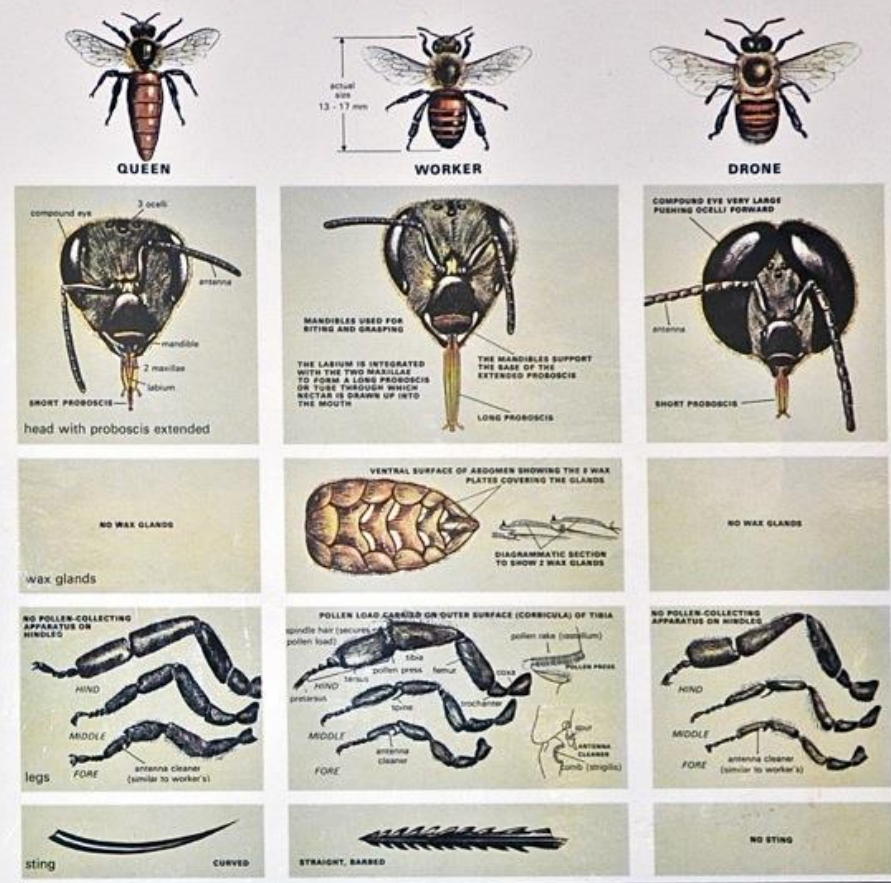


Development of brood from egg to adult

In the illustration below, daily development is shown diagrammatically from left to right. In fact, workers and drones are reared in cells that lie back-to-back across the comb, as in the drawing on the far right. Queens are reared in large cells that hang downwards.



Drones (male) develop from unfertilized eggs, and is fed. If it is to become a queen, it is fed profusely on given less (and less rich) food after the initial phase.



The queen and worker honeybees are female and the drone is male. There is normally only one queen in a colony, and she lays all the eggs. There are many workers (say 50,000 in summer), and they do almost all the work. In summer there may be a few hundred drones, but these die before winter.

What each worker bee does depends on her age and on the varying needs of the colony. Young bees work in the hive, first cleaning out used brood cells, and later feeding the brood, the queen and the drones. Some secrete wax for building or repairing the comb, process the nectar into honey, and pack pollen in the cells. Other bees guard the colony, using their stings if necessary.

The older worker bees go out of the hive, first on orientation flights and then to forage for what the colony requires: nectar, pollen, water or propolis (bee glue). Nectar is the carbohydrate food of bees, whereas pollen is a protein food, important for young workers, larvae, and the queen. Water may be needed by the bees feeding brood; also, in hot weather, bees collect and evaporate it to cool the hive. Water and nectar are carried in the honey sac, and so cannot be seen; pollen and propolis are brought home on the hindlegs. The legs, as well as the four wings, are attached to the thorax, which contains the muscles that enable the bee to walk and fly. The head contains several important glands, and the abdomen contains the honey sac as well as digestive and stinging organs.

The comb serves as a nursery for the brood and as a store for pollen and honey. The large queen cells are often built at the edge of the comb. Five are shown here.

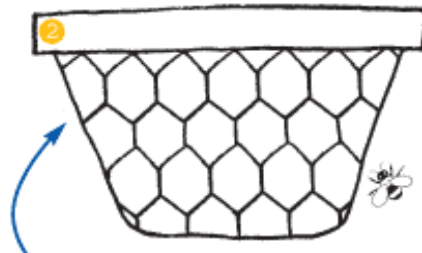
Building a Honeybee Hive

- Beehives come in several options: the most popular in the US is the Langstroth, however the Top Bar method is becoming more popular in developing countries for it's easy management, cheaper construction, and more suited for a backyard apiary is gaining prominence in the US, also
- The bottom of a Langstroth hive is called the brood: where the queen remains to lay eggs and where royal jelly, bee bread (processed pollen), and some honey is stored; the smaller boxes above the brood are called supers: only honey storage; best to allow bees one year to settle the hive and then add a new super per 2 years, additional brood box as needed; Langstroth hive boxes use “frames” for the bees to build comb in
- Top Bar hives have brood cells at the front and honey cells at the back - the bees do this naturally; adding a queen excluder does help, but some folks claim it's not necessary as the queen will normally stay close to the front; it won't produce gallons of honey, but will provide enough for a single family's annual needs
- Bee Skeps are no longer legal to use as it's too difficult to inspect for diseases; also the beekeeper kills a lot of brood to collect the honey

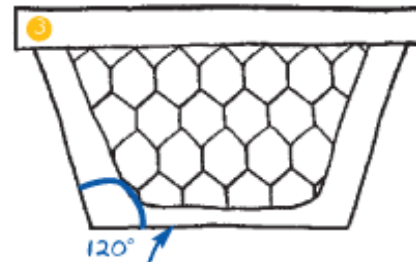


THE TOP BAR HIVE EXPLAINED

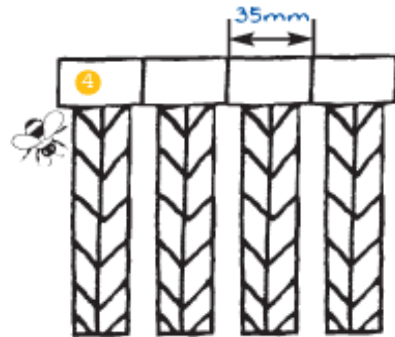
The design is different from hives you might be used to seeing in the UK, because it follows the natural shape of the honeycombs, which hang from horizontal bars laid across the top of the hive. These can be carefully lifted out, one by one, without disturbing the bees. This method produces more honey, more beeswax and gives a greater economic yield from a smaller investment.



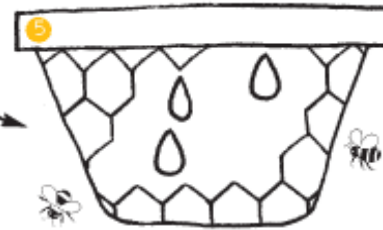
The hive keeps the natural stable u-shape of a comb, so they can be easily harvested.



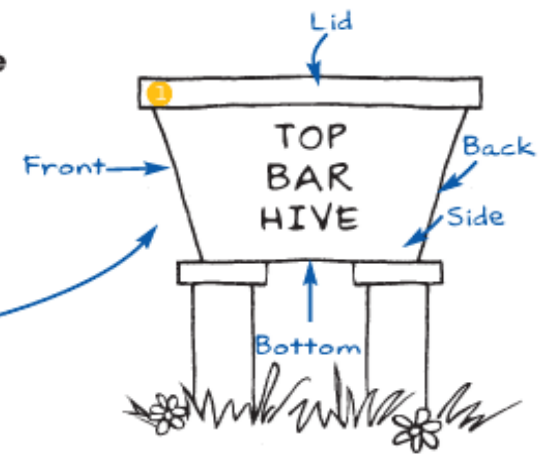
Sides of combs should be inclined at an angle of 120° , to stop wastage as combs don't stick to the sides of the hive.



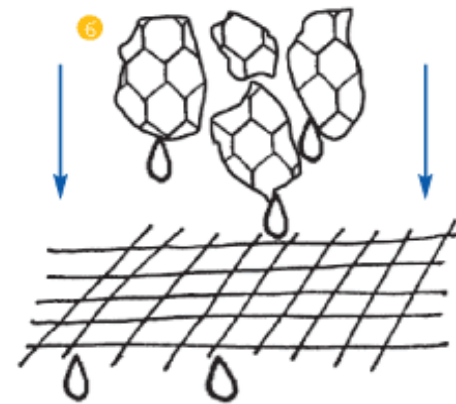
Each top bar is the natural width of a comb plus one bee: 35mm. Any wider, and predators could get in. Any smaller, and the bees couldn't build combs.



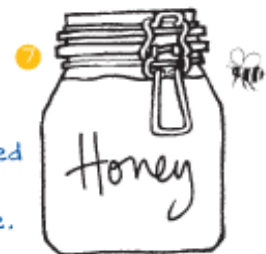
Bars are removed one at a time, minimising exposure of the colony. Comb is simply cut from the top bar.



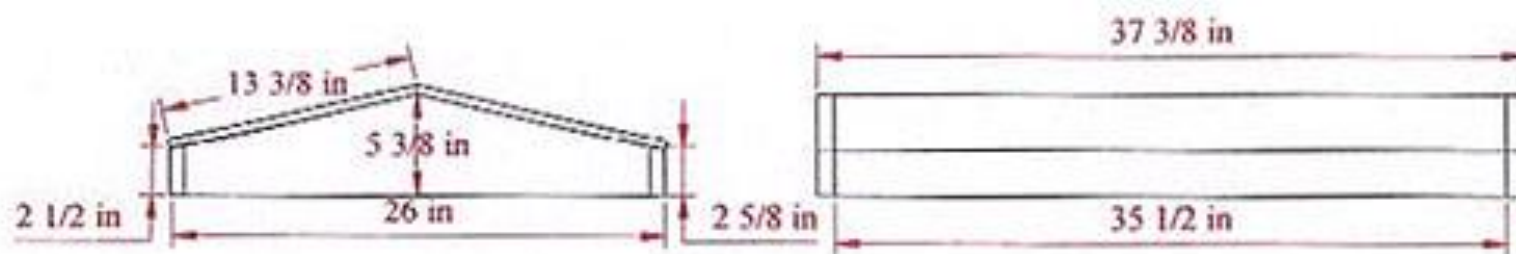
Stilts keep predators out and hive at working height.



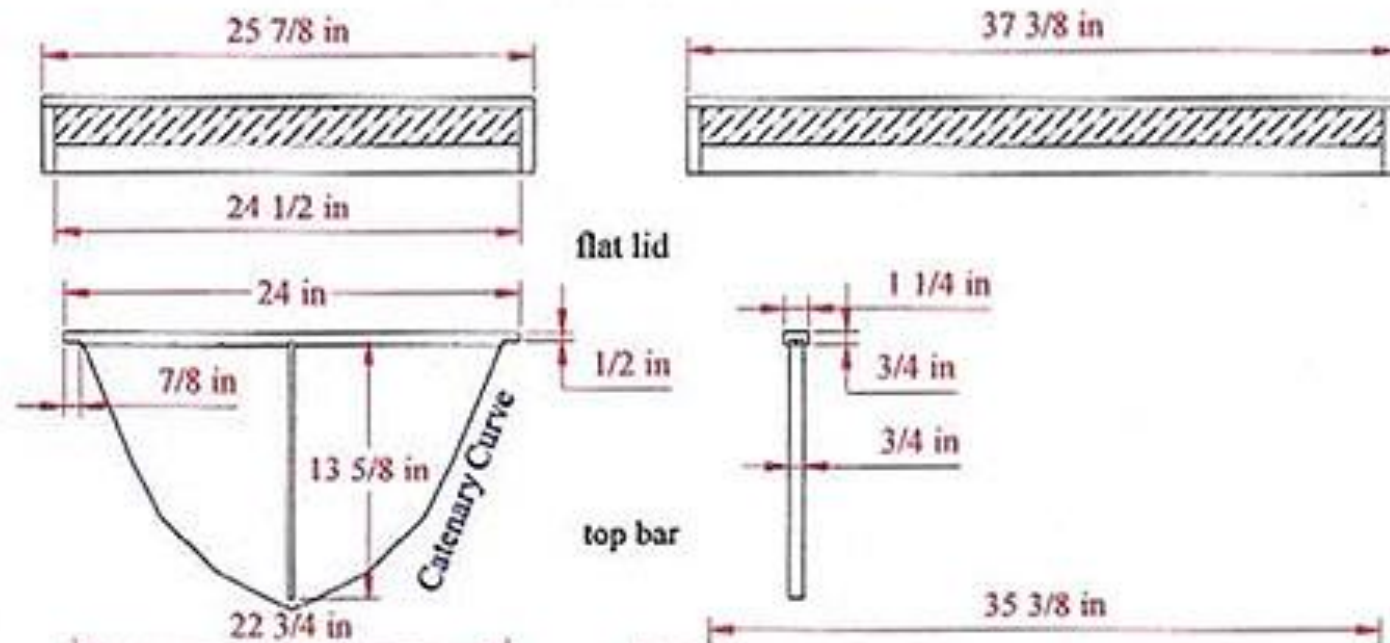
Combs are squeezed by hand then strained twice through a coarse strainer or screen, then a finer one.



Honey is bottled and capped ready for sale.

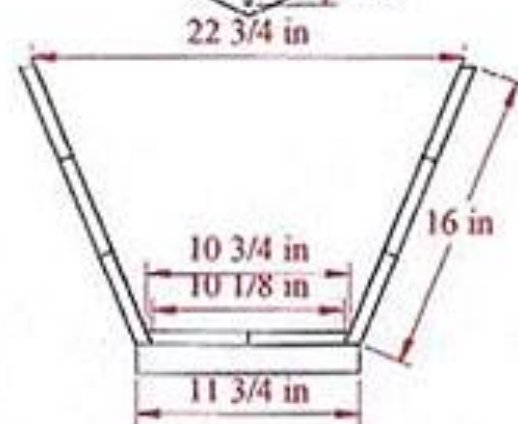


sloped lid
13 degrees off Horizontal

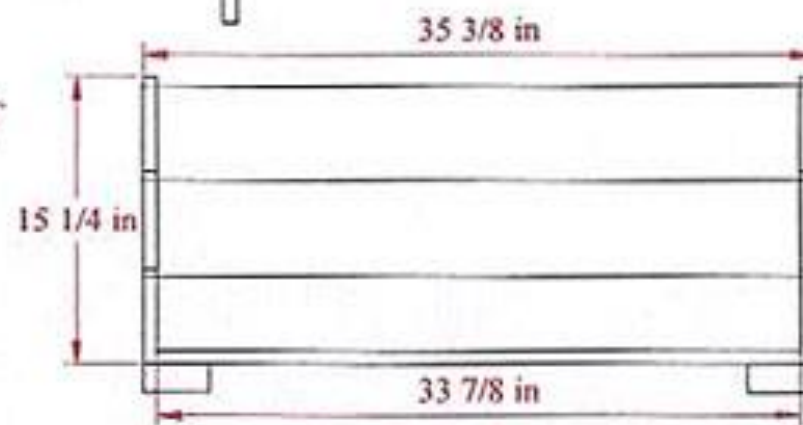


flat lid

top bar

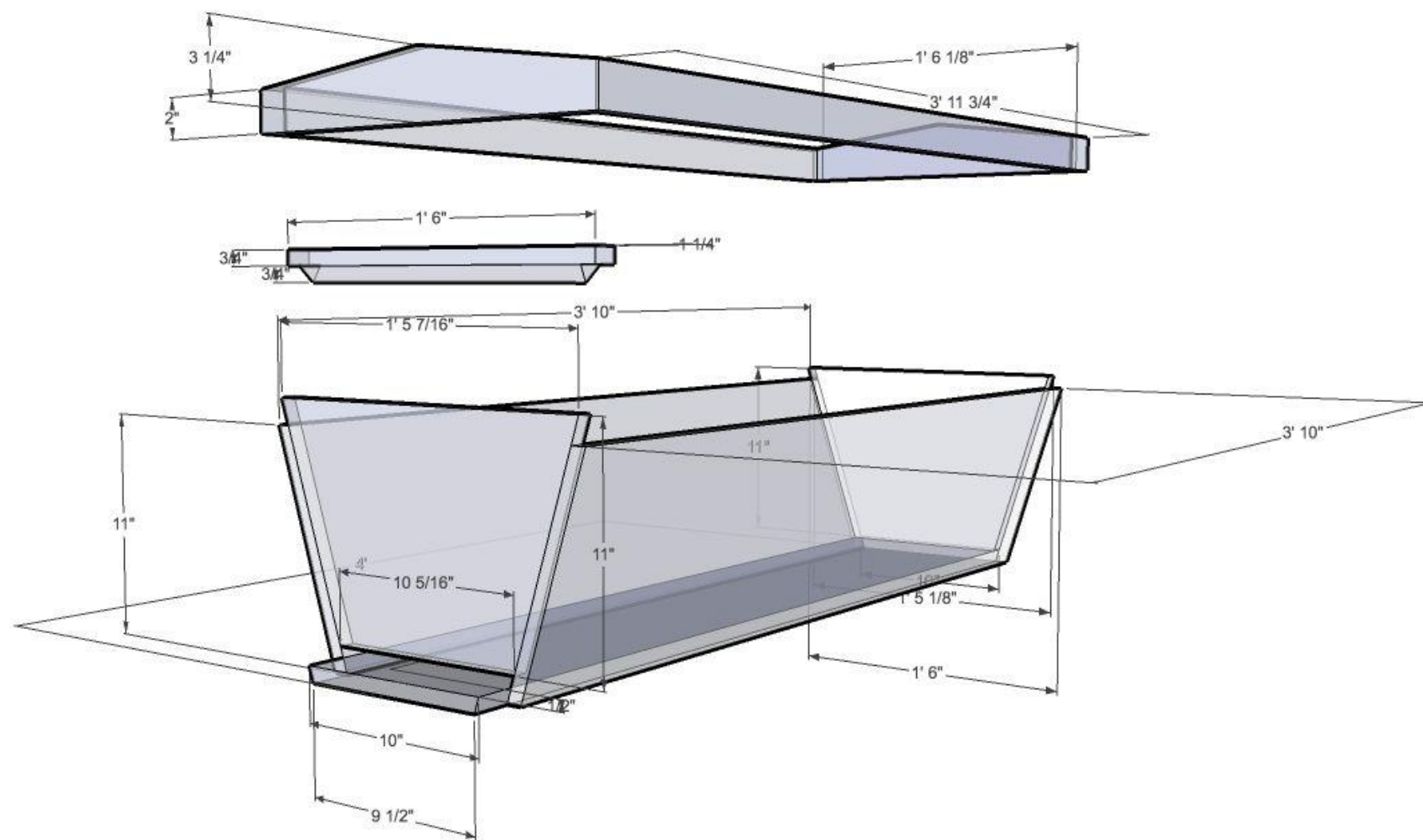


front view



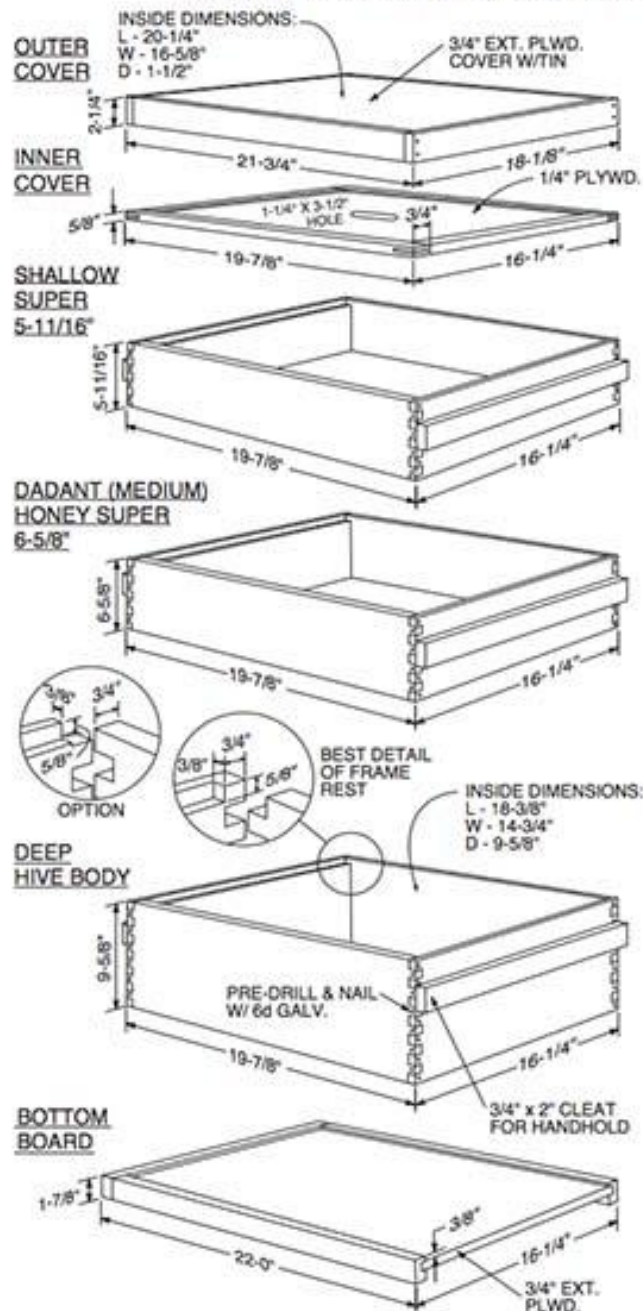
side view

Top Bar Hive
22.5 Degrees Off Vertical
27 Topbars



10-FRAME LANGSTROTH BEEHIVE

CONSTRUCTION DETAILS FOR 3/4" THICK LUMBER



The species of wood used to make a beehive can vary depending upon what is available in your area. The minimum thickness should not be less than 3/4". If you are using standard dimensional lumber, you can use 1x8 (3/4" x 7-1/4") for both shallow and medium super, and 1x12 (3/4" x 11-1/4") for the deep hive body.

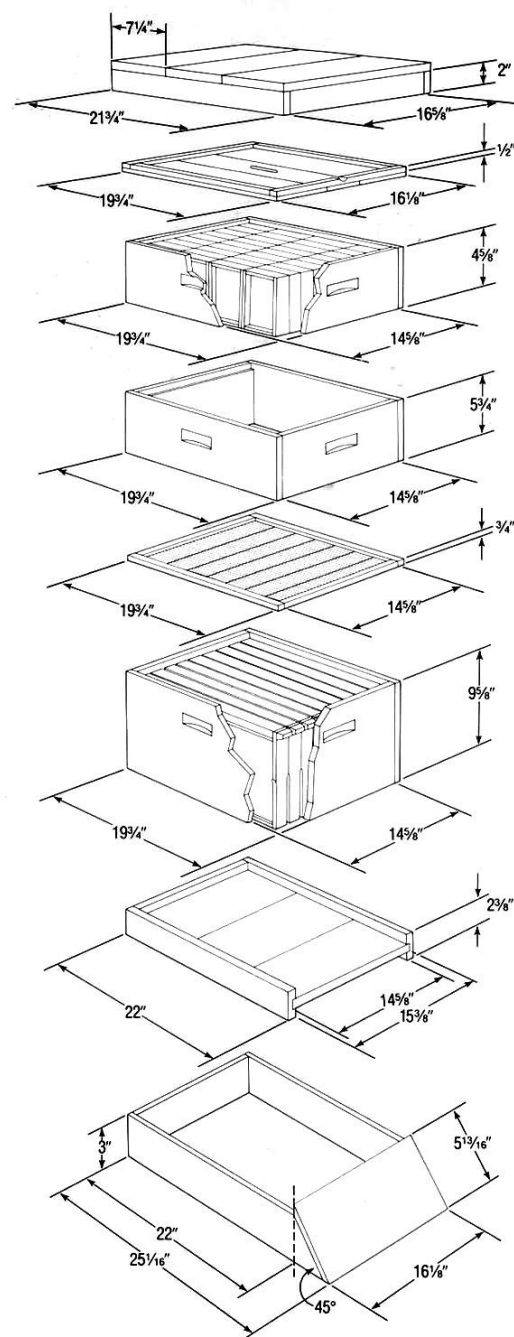
Start by cutting the boards to length. For fronts and backs, cut them a smidgen over 16-1/4". For sides, cut a smidgen over 19-7/8". Cut to exact size before assembling. At this point, cut box joints on all the board ends. Rabbet joints are an acceptable alternative.

Now that you have the joint cut and the boards cut to finished size, cut the 5/8" x 3/8" rabbet on the 16-1/4" boards stopping just short of the box joint pin at each end. (Chisel these square after the boards are assembled). Note detail of frame rest at left. Pre-drill holes for nails in each pin.

Assemble boxes with glue and nail each pin with a 6d galv. nail. Attach 1x2 handholds with screws and glue. Attach metal rabbets on the frame rest notch. Fill any holes and paint all exterior surfaces, both top and bottom edges, with primer and finish top coat.

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Figure 4. Equipment and dimensions for a standard Langstroth hive.



Outer Telescoping Cover

3 pieces 7 1/4" x 3/4" x 18 1/8" (top)
2 pieces 21 3/4" x 3/4" x 2" (sides)
2 pieces 16 5/8" x 3/4" x 2" (ends)

Inner Cover

2 pieces 1/2" x 3/4" x 16 1/8"
2 pieces 1/2" x 3/4" x 18 1/4"
2 pieces 6" x 3/8" x 19 3/4"
1 piece 4 1/8" x 3/8" x 19 3/4"

Section Comb Super

2 pieces 19 3/4" x 3/4" x 4 5/8" (sides)
2 pieces 14 5/8" x 3/4" x 4 5/8" (ends)

Shallow Extracting Super

2 pieces 19 3/4" x 3/4" x 5 3/4" (sides)
2 pieces 14 5/8" x 3/4" x 5 3/4" (ends)

Queen Excluder

2 pieces 19 3/4" x 3/4" x 5 3/4" (sides)
2 pieces 14 5/8" x 3/4" x 5 3/4" (ends)

Full Depth Hive Body

2 pieces 19 3/4" x 3/4" x 9 5/8" (sides)
2 pieces 14 5/8" x 3/4" x 9 5/8" (ends)

Bottom Board

3 pieces 7 1/8" x 3/4" x 15 3/8" (floor)
2 pieces 2 3/8" x 3/4" x 22" (sides)
1 piece 2 3/8" x 3/4" x 14 5/8" (end)

Hive Stand

1 piece 3" x 3/4" x 14 5/8" (back end)
2 pieces 3" x 3/4" x 25 1/16" (sides)
1 piece 5 13/16" x 3/4" x 16 5/8" (front end)

Beekeeping Equipment & Handling

•To prevent issues with bee stings, beekeepers wear full suits with a face veil for protection

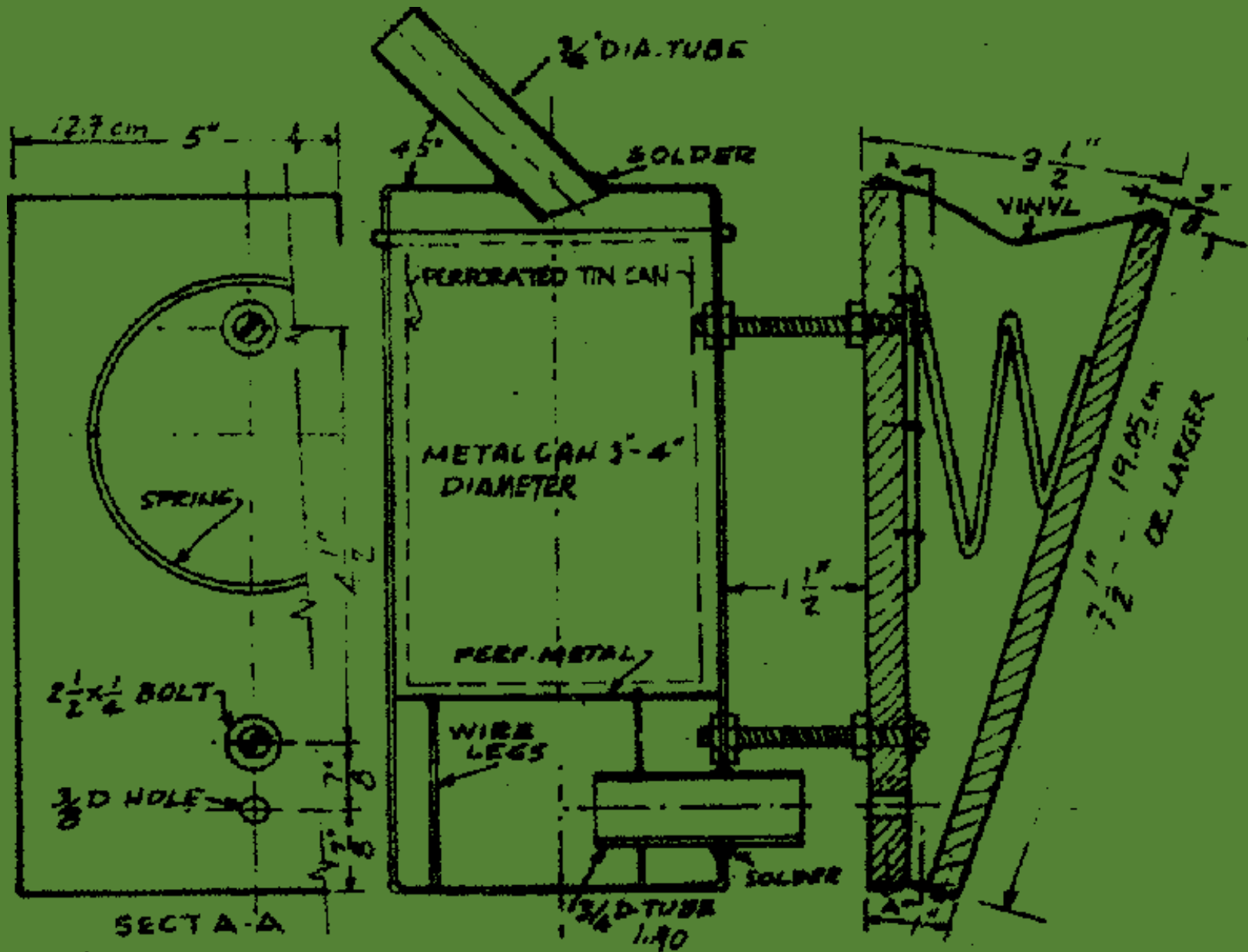
•A smoker uses bellows to blow smoke into the hive: the smoke “calms” (technically panics) the bees that they think hive is under threat of fire, so they fill with honey and wait to leave – this makes them less threatening to the beekeeper

•A hive tool is a thin crowbar used to pry frames loose and apart – be careful not to damage honeycomb if possible; filled frames must stay upright and top bar frames need extra support when taken out

•Handling bees does cause some anxiety at first and likely some stings; if they're calmed by smoke beforehand you can pry out one of the frames and gently brush the bees back into the hive – never shake them off or brush onto the ground; when removing and replacing frames do your best not to crush any bees – this will send out an alarm hormone and they'll attack

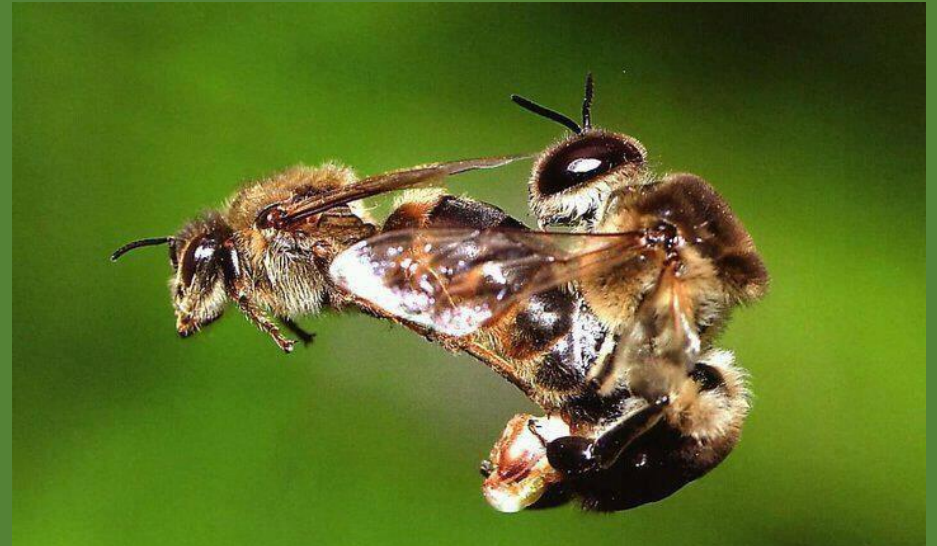


Beehive Smoker Plans



Honeybee Feeding and Queen Breeding

- Feeding the hive and breeding the queen are two things the keeper doesn't usually need to assist them with
- The queen will only leave the hive once to perform her “flight”: drones from hives miles away can sense and spot her, and will attempt to mate; a successful drone will mate and die from this; after a queen is mated, the workers will drive all other drones out of the hives to perish
- Worker bees will travel miles to collect enough nectar and pollen to feed the hive; bees process these foods into honey, royal jelly, and “bee bread”
- On the rare occasion the bees are low on food the keeper can provide a feeder of sugar water and a pollen substitute; you’re very likely to do this in the spring
- Do not leave unapproved sugar out in the open for your bees: in 2012, a hobby Apiarist left some red peppermint candy canes out for his bees – problems arose because bees from commercial hives also consumed the candy, turning a lot of local honey red and off flavor; the entire year's harvests required disposal



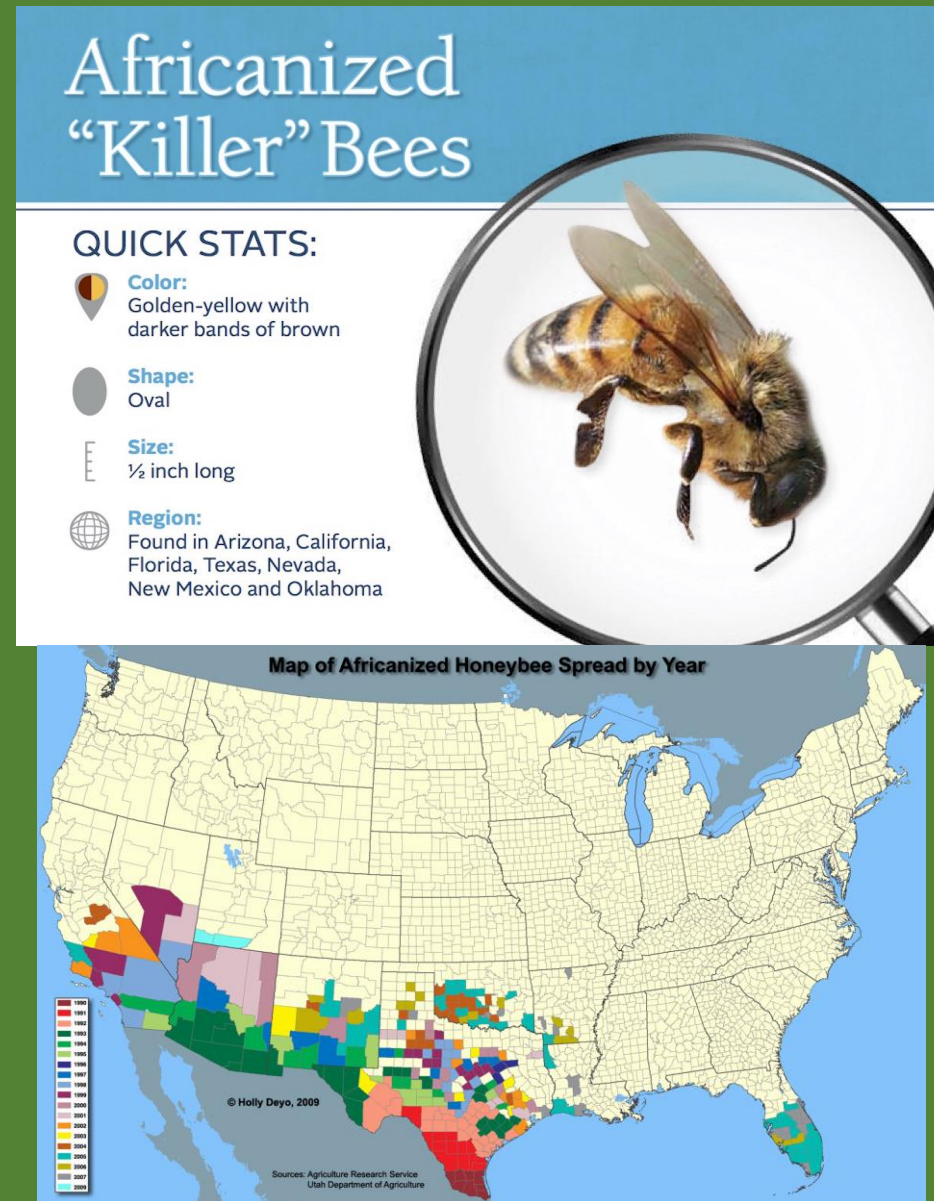
Swarming

- This is how hives (not queens) reproduce; individual bees are part of a larger organism that is the hive; when a hive becomes too large for its current location, a older queen allows a younger mated queen to take a number of workers with her to find a new place to live – this is swarming
- The best sign a hive is readying to swarm is backfilling (when brood cells are filled with honey instead of eggs); when this happens, you can either divide the hive yourself with a purchased queen or grow your own with queen barriers, or you can expand the brood area with extra cells to encourage the workers to stay and fill in the space



Africanized Bees

- Africanized bees are a hybrid of invasive African species and our varieties of European bees; the Africanized drone mates with the European queen, which permanently alters the entire colony
- There are no established strains of Africanized bees in Utah (sightings in Washington County) due to our cold winters – they can't survive them like European bees can



Honey

- The amount of honey you'll get depends greatly on the hive system you have: top bar hives are easier to manage, but will not produce gallons of honey (it will produce enough for a single family); Langstroth hives are built up with super's and the hive will continue to grow to fill that space
- Use a smoker: this will “calm” the bees and force them toward the queen in the brooding cells
- Brood cells are the lower levels of a Langstroth hive, at the front of a Top Bar hive; however, the queen will lay where she will – use a queen excluder to keep the queen in the brooding cells and the excess honey free of larvae
- Honeycomb is uncapped with a hot knife (keep the wax) and the honey extracted: Langstroth hives can be spun to force the honey out; Top Bar are best placed in solar boxes to heat the honey and allow it to drip out, or cut the comb out and eat as is; pasteurize your honey to kill parasites



Honey is the only food that will not rot. A jar of honey may remain edible for over 3000 years.





Six Benefits of Honey

Remember
no honey
for infants!



Mosquito Bite Relief



Honey's anti-inflammatory properties make it a good option to help reduce the itch and irritation of mosquito bites.

Immune Booster



Honey is full of polyphenols, a type of antioxidant that helps to protect cells from free radical damage.

Athletic Performance



Honey is superior in maintaining glycogen levels and improving recovery time and has been known to enhance athletic performance.

Ulcers



Recent research shows that honey may help disorders such as ulcers and bacterial gastroenteritis.

Wounds & Burns



Honey can be used as a natural cure in first aid treatment for wounds, burns and cuts because its antibacterial properties prevent infection and function as an anti-inflammatory agent.

Sore Throat & Coughs



Recent studies show honey helps with coughs, especially buckwheat honey.

[Facebook.com/Preparing4SHTF](https://www.facebook.com/Preparing4SHTF)

The information on Preparing for SHTF is not meant to take the place of health care or services you may need. Please see your primary health care provider about any personal health concerns.

Beeswax

- Bees cap honey cells with a natural wax; render the wax (heating followed by overnight chilling so the layers separate) to remove the excess honey
- To make candles: there's two methods to use: dipped and poured; for dipped candles, melt beeswax in two empty tin cans, drape twine on a dowel and tie a weight on both ends; to start, slowly dip into both cans at one time and quickly remove; followed by quickly dipping and removing to create successive layers; for poured candles, prepare a mold (egg carton, tin cans, milk jug, etc.) and hang some twine above each container, pour hot wax into the mold and allow to cool
- To make lotion: heat 1 ½ cups vegetable oil, ½ cup beeswax, and ¼ tsp potassium sorbate (optional preservative); heat on stovetop, do not boil, and whisk air into the mixture – remove from heat when looking like custard; pour into a container and cool; if potassium sorbate was added, it will last much longer



Alfalfa Leafcutter Bees

- If apiary work seems too time consuming or too scary then consider attracting leaf cutting bees to your property
- Necessary if growing alfalfa as honeybees are apprehensive with pollenating it; alfalfa flowers have a mechanism that literally punches the bee in the face with a pollen coated, thick stamen; leaf cutters will pollenate other plant's flowers as well
- Alfalfa leafcutters roam around looking for a place to set up their nest; if you provide them a place they will eventually find it and set up shop; "Bee Hotels" from the store work well, or drill holes in either wood or Styrofoam 3/8" diameter and up to 6" deep; leave outside in the springtime and wait; the bees care for themselves
- You will notice plants missing large cutout pieces; this is how the bees create nests in the tubes – they use the leaves to build cells for their eggs to hatch and develop into new bees; these cutouts are unsightly but not damaging to the plant
- These bees do not provide honey or wax – they are only pollinators; leaf cutters will co-exist with honeybees, but don't place the housing close together; there is no license required for leaf cutters



Hello Gardeners!

If you see neat, circular shapes cut
from leaves, they are only made by me –
a leafcutter bee.

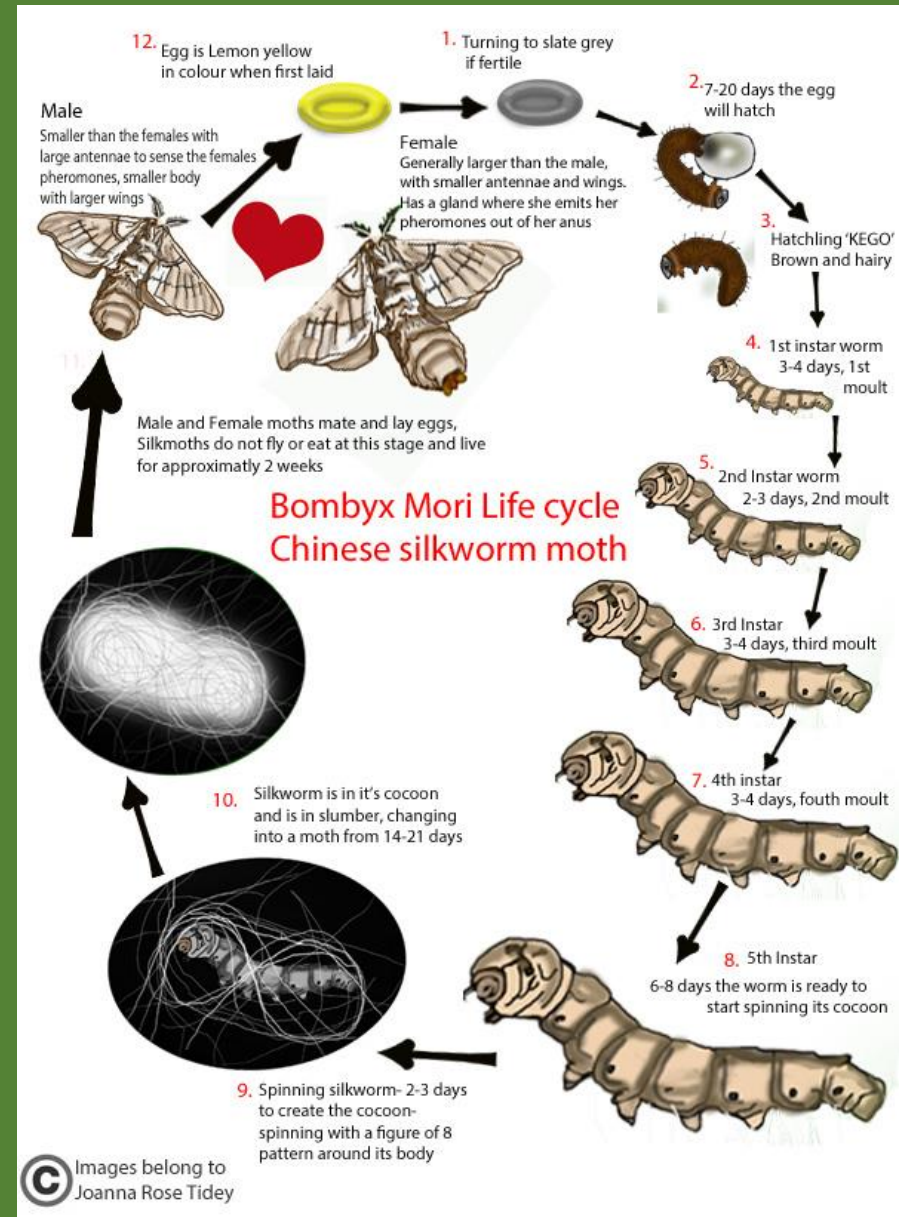
It won't harm your plant, so please don't
spray pesticide.

Thank you. xx



Sericulture (Silk Production)

- Sericulture has a colorful history in the Relief Society; silk was used for everything from temple garments and ladies dresses to strengthening threads for rope and doctor's sutures
- Zina D. H. Young (later served as third President of the Relief Society) began the Deseret Silk Association under the direction of the Church Presidency; women would place eggs in their cellars for the winter and hatch them in the spring; some women went so far as to hatch the eggs in scarfs worn around their necks to provide heat (one sister wrote in her journal the eggs started hatching during sacrament meeting and she struggled to keep her composure as they wriggled around her neck. Her and her husband sped home after the meeting and started them on feed)
- Families planted mulberry trees to feed silkworms; this activity was commonplace all over Deseret and many wild mulberry trees still exist here from this time period



Raising Silkworms

- Establish a cocoonery: keep a constant 75-80 degrees with mild humidity, free from drafts and pollutants, normal indoor lighting and no flashing lights, a screen to allow their manure to fall through, and a place for them to spin their cocoons
- Silkworms require plenty of space to grow, be protected, and have something to cling to; when they reach 3 inches in length, they stop eating and spend 2 days spinning a single thread that reaches up to 1,350 yards (4,050 feet) in length into a cocoon
- Best not to touch the worms much as they are delicate and very hungry; worms will die if injured
- If you have too many silkworms for your needs then freeze the extras and feed to poultry and fowls



Feeding Silkworms

- Silkworms have a 40-day lifespan with immense appetites requiring a constant and consistent supply of whole or chopped mulberry leaves; expect to be harvesting fresh leaves minimum twice daily
- Black Mulberry leaves are the best variety: Mulberry fruits are edible for the family (similar to blackberries); leaves are fast growing and excellent for paper production also; for raising silkworms you'll need several trees as the worms will eat a single mature tree bare in weeks
- Feed hatchlings 4-5 leaves each worm per day, when one inch long and more feed each worm leaves by the dozens each day as they have voracious appetites; do not provide water – they get it through the fresh leaves or moist processed feed
- There is processed silkworm feed available online; best to have some on hand and know how to use it before it's needed; microwave small batches of meal and while very warm roll into sausage shapes using some plastic wrap, seal and keep for weeks in the fridge – use as needed



Breeding Silk Moths

- Silkworm chrysalis become moths two weeks after going into metamorphosis
- The difficulty in breeding is containing the moths and collecting the eggs; hold back a number of cocoons in an enclosed space with plenty of fresh air and a bed of paper towels waiting for them; move the cocoons very carefully only once, this is important; keeping them in paper towel tubes works well
- Due to their breeding for silk production, they are likely not capable of flight anymore and will have no appetite; the males are smaller than the females, but have larger wings; females release a pheromone that's brown in color to attract the male; one male can mate with multiple females; after they mate, place a barrier around the female so she will lay the eggs in a concentrated space, making your job easier
- The eggs will be yellow and then turn black if fertilized; gestation is 7-20 days – extend this by placing black eggs in the high humidity part of the refrigerator (70-80%) for up to five years; when ready to hatch place them in the cocoonery with full sun to warm up
- Special thanks to Rachelle/Pigellet79 for their help



Preserving the Harvest

.Storing excess at the height of the season will cut food budgets considerably

.Drying, canning (bottling), cellar, pickling, freezing, fermenting, etc.

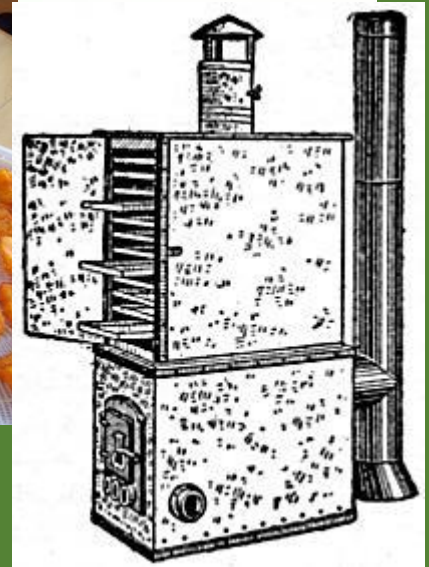
.Some vegetables do well stored outside during winter, a method called “heeling”; dig a one foot deep trench and place in leeks and celery a few inches apart, and cover with soil followed by a thick layer of straw; will keep for months

.Freeze-drying, newer method for the home, preserves foods to shelf stable and nearly unaltered flavor; the equipment is expensive



Drying/Dehydrating

- Removing moisture to preserve foods – required for all cereal grains
- Concentrates sugars and locks in nutrients
- Most economical method – lowest cost for results
- Some foods need antioxidants (citrus or commercial) or flavoring added before processing
- Slice fruits, vegetables and meats as thin as you can; treat with a marinade, brine, or an antioxidant preservative; place in the sun, in a warm ventilated oven, or a dehydrator until moisture content reaches the appropriate amount; store long-term in airtight containers with an oxygen absorber



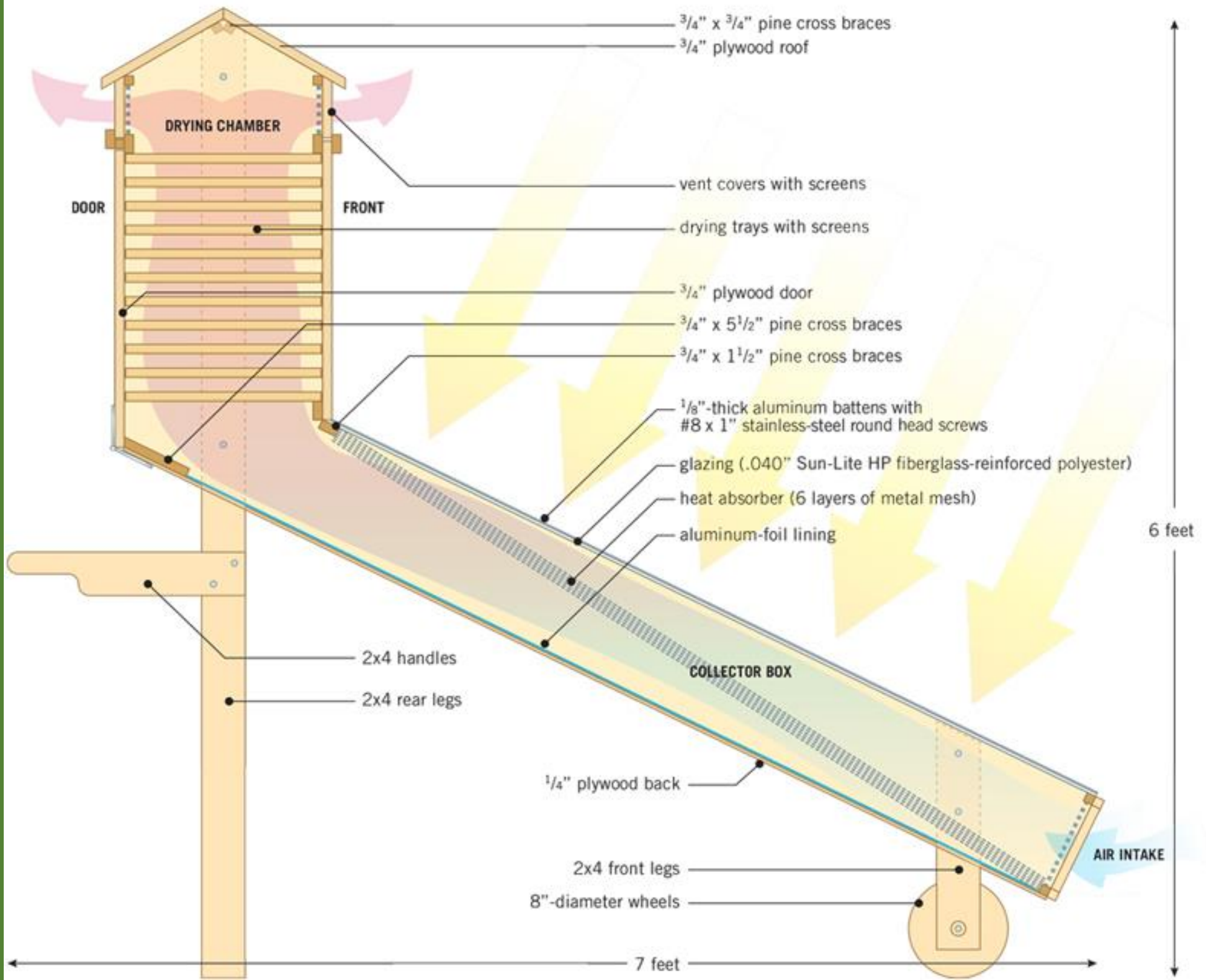
Vegetable	Preparation	Blanching Time* (mins.)	Drying Time (hrs.)
Asparagus	Wash thoroughly. Halve large tips.	4-5	6-10
Beans, green	Wash. Cut in pieces or strips.	4	8-14
Beets	Cook as usual. Cool, peel. Cut into shoestring strips 1/8" thick.	None	10-12
Broccoli	Wash. Trim, cut as for serving. Quarter stalks lengthwise.	4	12-15
Brussels sprouts	Wash. Cut in half lengthwise through stem.	5-6	12-18
Cabbage	Wash. Remove outer leaves, quarter and core. Cut into strips 1/8" thick.	4	10-12
Carrots, parsnips	Use only crisp, tender vegetables. Wash. Cut off roots and tops; peel. Cut in slices or strips 1/8" thick.	4	6-10
Cauliflower	Wash. Trim, cut into small pieces.	4-5	12-15
Celery	Trim stalks. Wash stalks and leaves thoroughly. Slice stalks.	4	10-16
Chili peppers, green	Wash. To loosen skins, cut slit in skin, then rotate over flame 6-8 minutes or scald in boiling water. Peel and split pods. Remove seeds and stem. (Wear gloves if necessary.)	None	12-24
Chili peppers, red	Wash thoroughly. Slice or leave whole if small.	4	12-24
Corn, cut	Husk, trim. Wash well. Blanch until milk in corn is set. Cut the kernels from the cob.	4-6	6-10
Eggplant	Wash, trim, cut into 1/4" slices.	4	12-14
Horseradish	Wash, remove small rootlets and stubs. Peel or scrape roots. Grate.	None	6-10
Mushrooms**	Scrub. Discard tough, woody stalks. Slice tender stalks 1/4" thick. Peel large mushrooms, slice. Leave small mushrooms whole. Dip in solution of 1 tsp. citric acid/quart water for 10 minutes. Drain.	None	8-12
Okra	Wash thoroughly. Cut into 1/2" pieces or split lengthwise.	4	8-10
Onions	Wash, remove outer paper skin. Remove tops and root ends, slice 1/8 to 1/4" thick.	4	6-10
Parsley, other herbs	Wash thoroughly. Separate clusters. Discard long or tough stems.	4	4-6
Peas	Shell and wash.	4	8-10
Peppers, pimentos	Wash, stem. Remove core and seeds. Cut into 1/4 to 1/2" strips or rings.	4	8-12
Potatoes	Wash, peel. Cut into 1/4" shoestring strips or 1/8" thick slices.	7	6-10
Spinach, greens like Kale, Chard, mustard	Trim and wash very thoroughly. Shake or pat dry to remove excess moisture.	4	6-10
Squash, summer or banana	Wash, trim, cut into 1/4" slices.	4	10-16
Squash, winter	Wash rind. Cut into pieces. Remove seeds and cavity pulp. Cut into 1" wide strips. Peel rind. Cut strips crosswise into pieces about 1/8" thick.	4	10-16
Tomatoes	Steam or dip in boiling water to loosen skins. Chill in cold water. Peel. Slice 1/2" thick or cut in 3/4" sections. Dip in solution of 1 tsp. citric acid/quart water for 10 minutes.	None	6-24

Blanching and Drying Times for Selected Vegetables

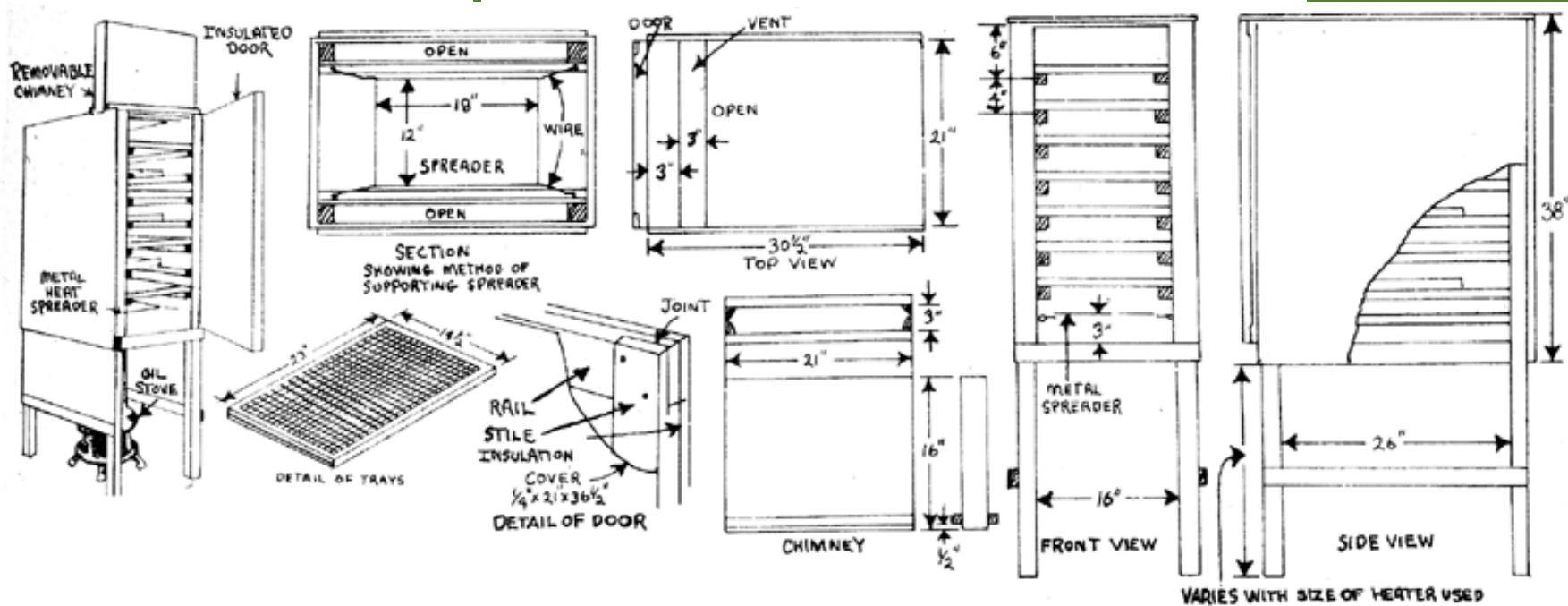
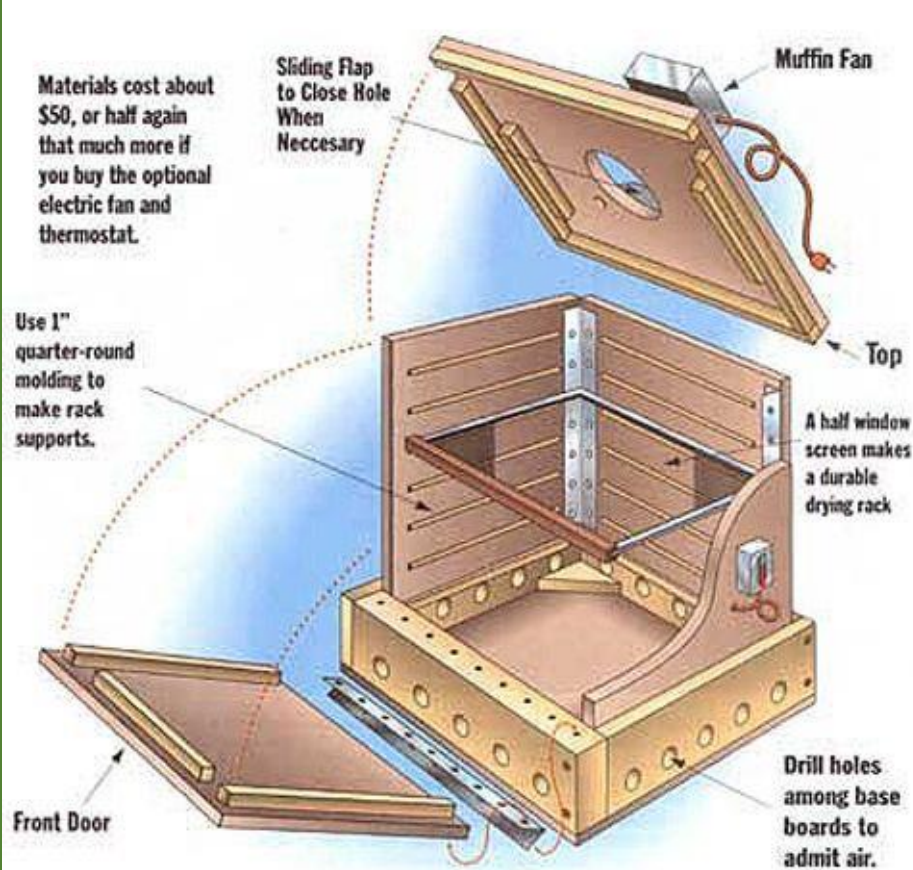
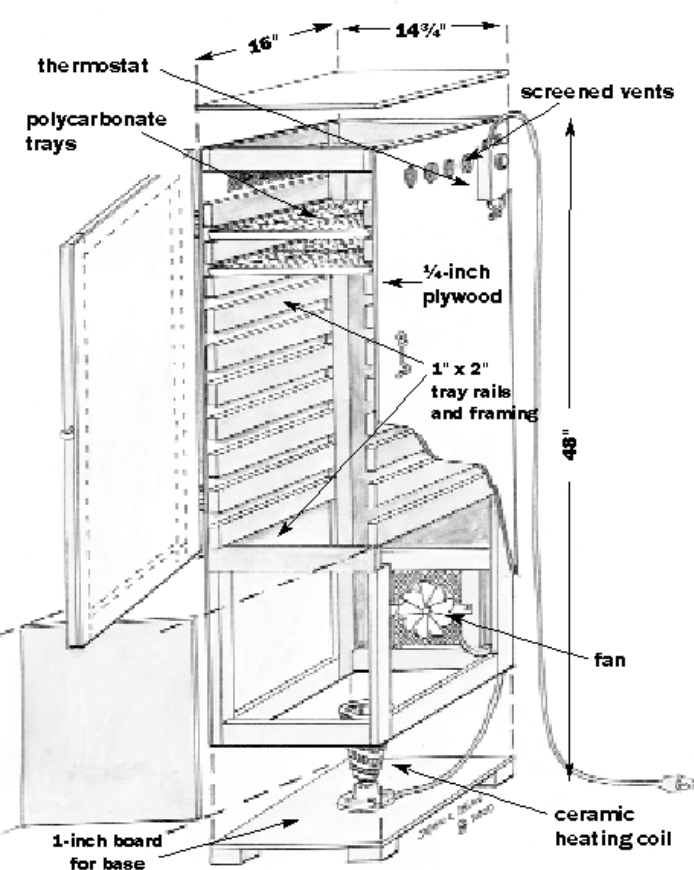
Vegetable	Blanching		Drying time (hrs)*
	Method	Time (mins)	
Beets	cook before drying		3½–5
Carrots	steam	3–3½	3½–5
	water	3½	
Corn	not necessary		6–8
Garlic	not necessary		6–8
Horseradish	not necessary		4–10
Mushrooms	not necessary		8–10
Okra	not necessary		8–10
Onions	not necessary		3–6
Parsley	not necessary		1–2
Peas	steam	3	8–10
	water	2	
Peppers	not necessary		2½–5
Potatoes	steam	6–8	8–12
	water	5–6	
Pumpkin	steam	2½–3	10–16
	water	1	

* Dried vegetables should be brittle or crisp.



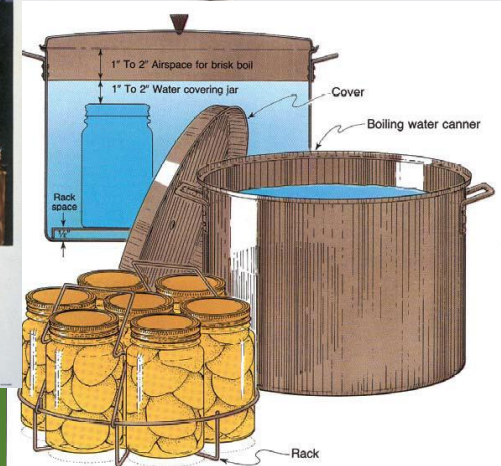


Three Electric Dehydrator Plans



Canning/Bottling

- Uses 3 different methods of preservation: heat, pressure, and acid
- Canning is done in metals cans; dry goods with oxygen absorber, or moist goods using specialized equipment
- Bottling is done in tempered mason jars with special lids; after removing from the canner, set out to cool slowly on the kitchen counter and listen for a tell-tell “pop” sound – this is the lid turning inwards from the cooling creating an internal vacuum
- Water bath canners or steam canners are cheaper, less time consuming, and safer to operate – only high acid foods
- Pressure canners are more expensive, uses more time, and carries some risk – use for both high and low acid foods
- Watch for signs of botulism



A HOW-TO GUIDE

Washington State is known for its outstanding stone fruits. Summer is the season for stone fruits, but would you like to enjoy them year round? Canning may be your best (and most delicious!) option.

WHAT YOU CAN CAN!

ITEMS YOU WILL NEED		JARS, LIDS, AND RINGS			
	WATER BATH CANNER		CHERRY PITTEER (OPTIONAL)		
		JAR FUNNEL		LEMON	

When canning stone fruits, it's important to use a bath canning system because of the fruits' natural acidity. Make sure to sterilize all materials prior to canning food.

PREPARING STONE FRUIT FOR CANNING

CHERRIES ▶ Remove stems ▶ Remove pits (optional) ▶ Cut in half (optional)	PLUMS ▶ Remove stem and wash ▶ Freestone variety can be halved and pitted ▶ Fill jar with plums and fill with water or syrup	APRICOTS ▶ Wash well ▶ Remove the skin ▶ Boil, blanch, and remove skin (optional) ▶ Slice into portions (optional)	PEACHES ▶ Wash well ▶ Remove pit ▶ Boil, blanch, and remove skin (optional) ▶ Slice into portions (optional)
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NOTE: If you decide not to pit, always poke a couple small holes in the sides of the fruit to prevent tears in the skin.

IS YOUR FRUIT READY TO GO?

LET'S START CANNING!
Fill canner about halfway with fresh water. Keep water 1-2 inches above jars.

2 INCHES IS ABSOLUTELY NECESSARY FOR PROCESSES TAKING 30+ MINS.

Prepare soon-to-be canned food as stated in recipe and fill your jars.

AFTER ADDING JARS, TURN HEAT TO MAXIMUM FOR AN INTENSE BOIL.

After the set time, remove the lid.

WAIT 5 MINUTES before removing cans.

ALLOW TO COOL for anywhere from 12 to 24 hours without disturbing.

Visit SweetPreservation.com for recipes and find more canning tips in their Preservation 101 section

FUN FACTS ABOUT CANNING

CANNING IS VERY AFFORDABLE. ➡ **A NEW CANNER CAN COST \$100** but will quickly pay itself off.

If you have fruit bearing plants on your property, **CANNING WILL SAVE** dropped fruit.

CANNED FOOD WILL NOT SPOIL IF YOU LOSE POWER

TALKING AND SHOPPING AROUND CAN GREATLY REDUCE OVERHEAD PRICE.

LOOK FOR HAND-ME-DOWNS JARS, CANNERS, ETC.

CANNING LOCKS IN THE NUTRIENTS OF STONE FRUITS AND CAN EVEN IMPROVE VITAMINS IN OTHERS.

SOURCES:
<http://www.preservation.com/recipes>
<http://www.preservation.com/health-benefits>
<http://www.freshandfresh.com/the-benefits-of-canned-food/>
<http://mylifefirst.blogspot.com/2014/05/Does-Canning-Your-Own-Food-Save-you-Money.html>
<http://nchfp.uga.edu/publications/usda/GUIDE%20to%20Home%20Canning.pdf>
<http://wholemymom.com/whole-new-budget/which-comes-the-least-dehydrating-freezing-or-canning/>

Canning Techniques

Place 2"-3" of hot water in canner and place jars in canner on canner rack.

1.

Exhaust all air from the cooker with vent port open.

2.

To pressurize the canner, place weight on vent port.

3.

Begin timing when weight starts to rock or jiggle, or when pressure gauge reads the correct pressure.

4.

Regulate heat for a steady rocking or jiggling motion or proper dial gauge pressure.

5.

Remove from heat.

6.

After cooling, open vent port. Wait 2 minutes; then open cooker, lifting lid away from you.

7.

Place jars on rack or towel and allow to cool slowly.

8.

Botulism poisoning

Source of trouble

Low-acid foods that were improperly canned.

Trouble signs

- Clear liquids turned milky
- Cracked jars
- Loose or dented lids
- Swollen or dented cans
- An "off" odor



Home canned foods

Prevention

- Examine all canned foods before cooking
- Cook and reheat foods thoroughly
- Keep cooked foods hot (above 140 degrees) or cold (below 40 degrees)

Symptoms after eating

- Double vision
- Droopy eyelids
- Trouble speaking, swallowing or breathing
- Untreated botulism can be fatal

Freezing

- Quickest way to store garden produce
- Some foods require 'blanching' before freezing: place in hot water for a few minutes, then take out and plunge into ice water for another few minutes
- Not economical for long-term storage: most foods last 3 months to a year before nutrient depletion takes place; costs extra to keep freezer powered for that long



Blanching Times for Fruits and Vegetables:

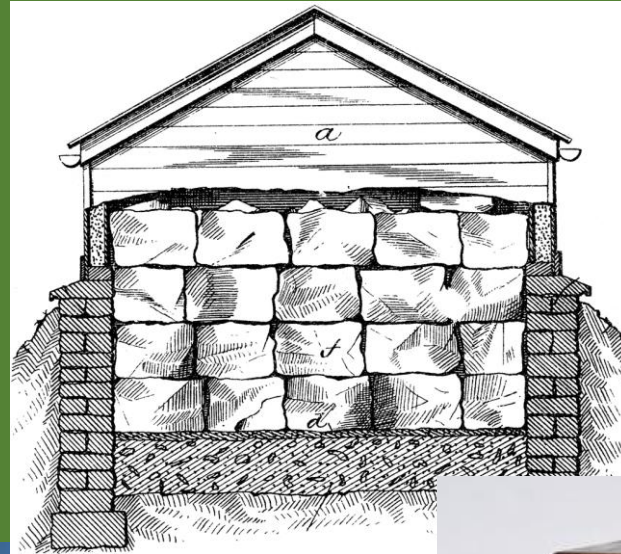
Table of Blanching Times		
Fruit/Vegetable	How Long To Boil	How Long To Ice
Blanch Green Beans for	3-5 Minutes	3-5 Minutes
Blanch Brussel Sprouts for	3-5 Minutes	3-5 Minutes
Blanch Broccoli for	3 Minutes	3 Minutes
Blanch Cauliflower for	3 Minutes	3 Minutes
Blanch Spinach for	2 Minutes	2 Minutes
Blanch Asparagus for	2-4 minutes	2-4 Minutes
Blanch Tomatoes for	30 Sec – 1 Min	30 Sec – 1 Min
Blanch Peas for	1 Minutes	1 Minutes
Blanch Snap Peas for	2-3 Minutes	2-3 Minutes
Blanch Corn on the Cob for	7-11 Minutes	7-11 Minutes
Blanch Peaches for	40 Seconds	40 Seconds

Ice Production and Storage

•In older days, ice was the primary means of refrigeration for urban families; cut from a farm's frozen winter pond and stored in a specialized house with thick insulation, or insulated with straw or sawdust

•The only reasons to use ice as a preservation method is to chill large items when you have little refrigeration space, or when power is very expensive, or a prolonged power outage

•To quickly make ice in the winter: use a medium-sized Tupperware bin (roughly 1' X 1' X 2') and fill with the bottom with ice cubes; place outside and dump cold water about 2" deep and wait 30 minutes to freeze then add another 2" layer of water; repeat until you have a thick block of ice



Cellar

- Not a common suburban method nowadays for storing garden foods - not feasible for apartments/renters
- A simple sunken garbage can or plastic bin will suffice; be sure the entire container is insulated with earth, straw, or other means at least 2' on all sides
- Clamping is a cellar method of storing root crops in the garden under straw and a large pile of soil; do not let the root crops touch soil directly or they will rot – surround with a 1' layer of straw
- Keeps foods at a steady cool temperature using the earth - no power required; works good for eggs in waterglass



How To Build A Root Cellar



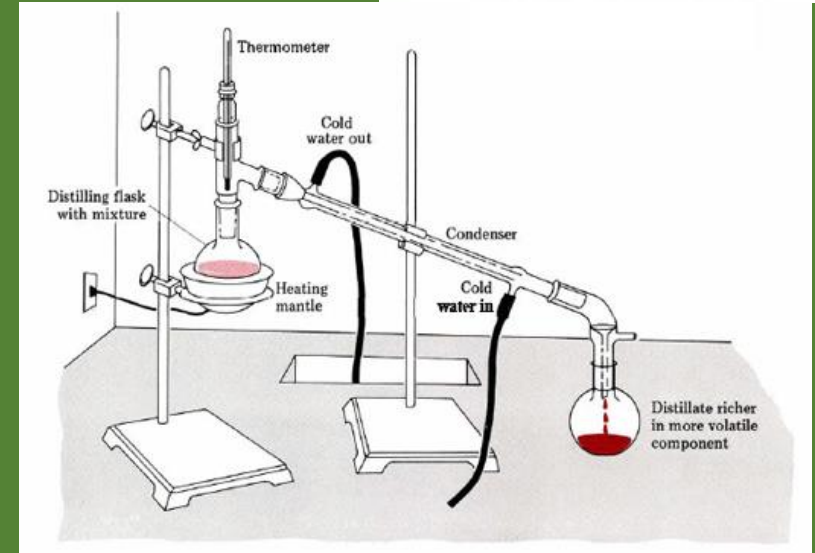
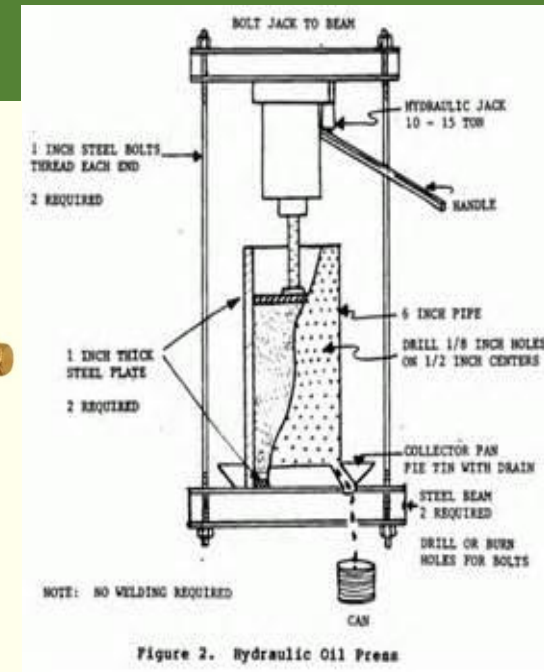
Oils

- Extraction of essential oils and fats from seeds is a little difficult, but the payoff is great

- Use pressure extraction, alcohol extraction, or a distiller/condenser; Distillation takes the most amount of time and energy, but the product is much cleaner; pressing out the oil is quicker, but needs repeated filtering through cheesecloth and filter paper to get clean results

- Olive oil for consecration must be extra virgin, “No chemicals or extreme heat may be used during the extraction process. ‘Extra Virgin’ also denotes that the oil is free of defects of flavor or odor.” California Olive Oil Council definition; Mission olive trees grow best in our region and supply good oil

- Sunflower, cottonseed, nuts, and some herbs and spices are good sources



Fermentation

•NOT FOR DRINKING!!!

•Yeast fermentation creates ethanol (ethyl alcohol); this is toxic to consume internally as ethanol starves the body of nutrients and oxygen; useful in hundreds of chemical formulas we use daily, and used in tens of thousands of chemical processes

•First stage beer mash is excellent for baking bread in Utah's higher altitudes; if concerned about handling beer mash – soak and sprout the barley then dry and grind into a fine flour called malt; add 4 tsp of malt to 1 tsp yeast before adding to the bread

•Cooking with wines (deglazing) releases flavonoids and helps keep pans clean – ethanol vaporizes at 84° F; food will not be tainted

•Fermentation is used to make sauerkraut and other foods; Sauerkraut (fermented cabbage) requires a few months time but little equipment

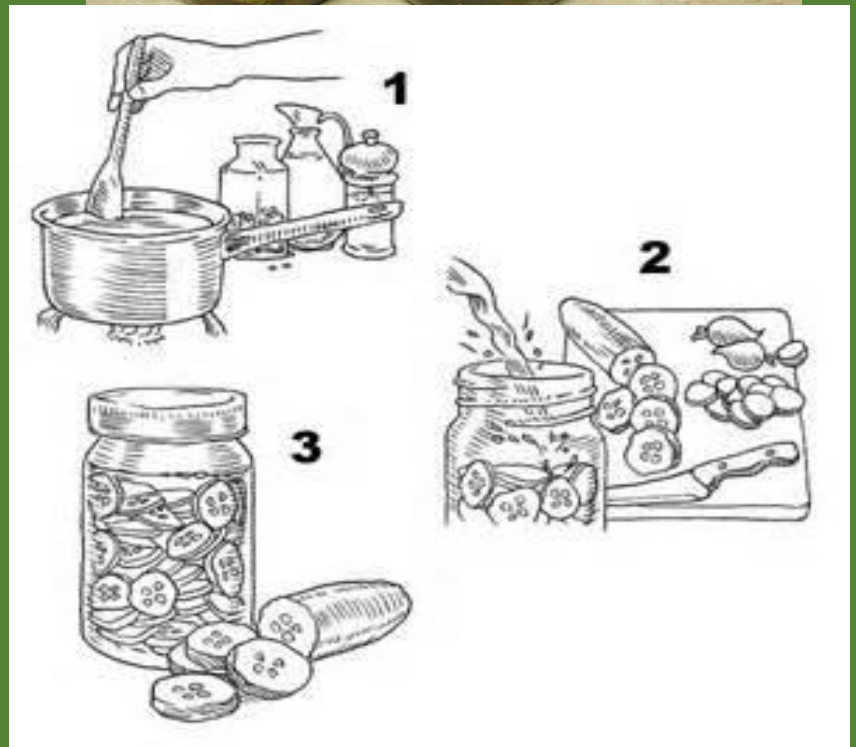


Pickling

•Combining vinegar, salt, sugar, and spices that encourages preservation; pickling is used to store low acid foods in a high acid/sugar/salt solution; quick method pickling is just as good as normal methods

•Pickle vegetables before preserving in a water bath canner if no pressure canner is available (pressure canning does not require pickling prior to canning); follow only canner pickling recipes to prevent botulism

•This method works on fruits (such as pickled pears and pickled peaches), vegetables (cucumber dills, salsa, relishes), & meats (kielbasa, bologna, ham hocks), but don't can meats with a water bath canner



HOW TO QUICK PICKLE ALMOST ANYTHING

STEP 1

Combine equal parts water and vinegar



STEP 2

Add 1 tablespoon coarse sea salt and 2 tablespoons sugar or honey



(PER POUND OF PRODUCE)

STEP 4

Pour over produce to be pickled

ADD FRESH HERBS, IF DESIRED



STEP 3

Bring mixture to a boil along with any whole spices



STEP 5

Cool to room temperature before refrigerating for at least 1 hour or up to a week



Fermentation vs Pickling

	Fermentation	Canning/Pickling
Preserving Liquid	Brine → Lactic Acid	Vinegar
Environment	Clean	Sterile
Probiotic (alive)	✓ Encourages Good Bacteria	✗ Kills All Pathogens
Adds Nutrients	✓	✗
Speed	Slow	Fast
Flavor	Complex	One-Note
Shelf Stable	✗	✓



Source: <http://www.fermentersclub.com>

Processing Sugar Beets and Maple Sap

- Sugar beets: pull and process same day – pulling and lingering will convert the sugars to starch; scrub off soil with a hard brush and cold water only; cut off tops and feed to livestock; shred the beets with either a grater or food processor; place shreds and any liquid in a stockpot and fill with water until just covering the beets; boil for 15-45 minutes depending on size of the pot; strain and save liquid, press out remaining liquid from beet shreds (save shreds for livestock feed); simmer liquid and reduce to a syrup, and gently pour into shallow trays to dehydrate until crystalized; crush crystals and dry in low heat; save until needed
- This produces raw sugar – a mix of white, brown, and molasses w/ plant vitamins and minerals; centrifuging during evaporation separates white sugar, brown sugar, and molasses
- Maple Syrup: same as sugar beets in the liquid boiling stage, except keep on heat until thickened and color darkens and test with a hydrometer for concentration

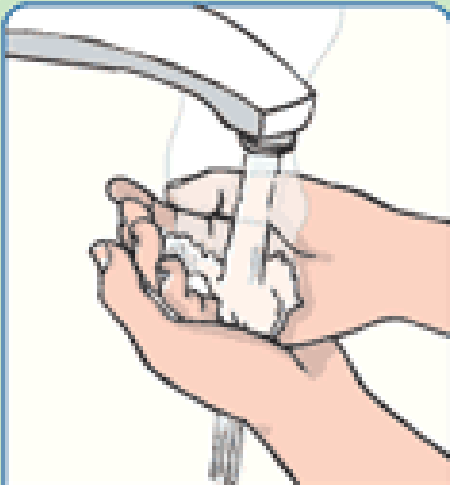


Cooking

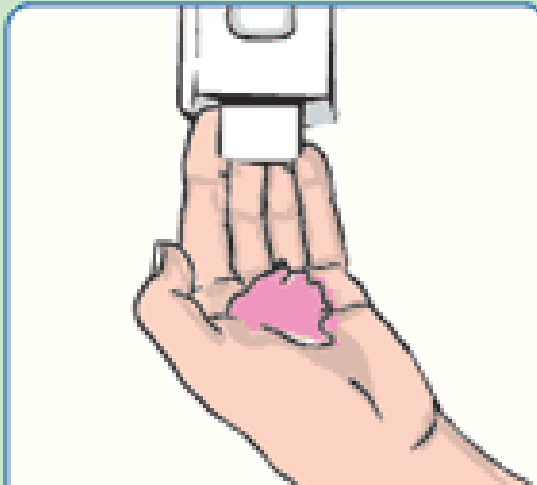
- With our ingredients harvested and preserved, cooking becomes our next and most artistic step
- In pioneer times and in Old Deseret, our cuisine followed a simple rule still observed today, “Plain, but wholesome”; however, we have more ingredients and foods available, along with better cooking skills to create our own local Haute Cuisine and still incorporate our traditions as “Wholesome, simple, but elegant”
- All food preparations begin with sanitation and cleanliness; wash hands properly, wear appropriate clothing, keep utensils and surfaces sanitized, and always observe proper temperatures – better a lot of sanitary practices now than a world of heartaches later



FIGHT GERMS BY WASHING YOUR HANDS!



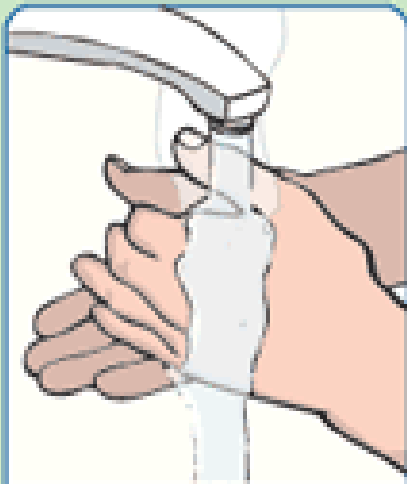
1 Wet your hands



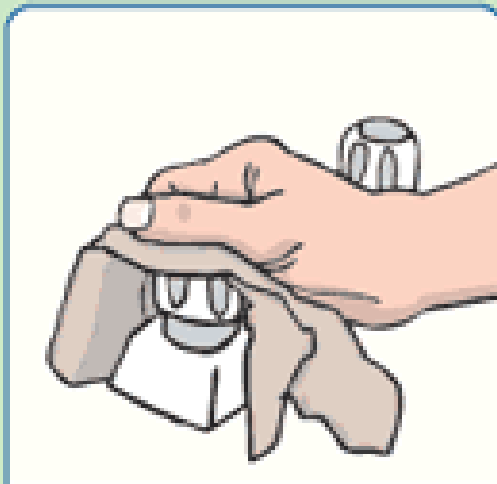
2 Soap



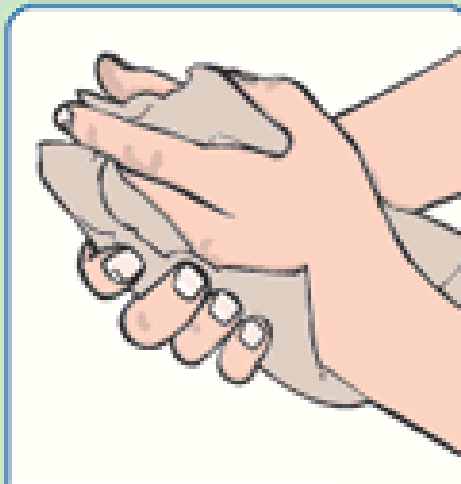
3 Lather and scrub - 20 sec



4 Rinse - 10 sec



5 Turn off tap

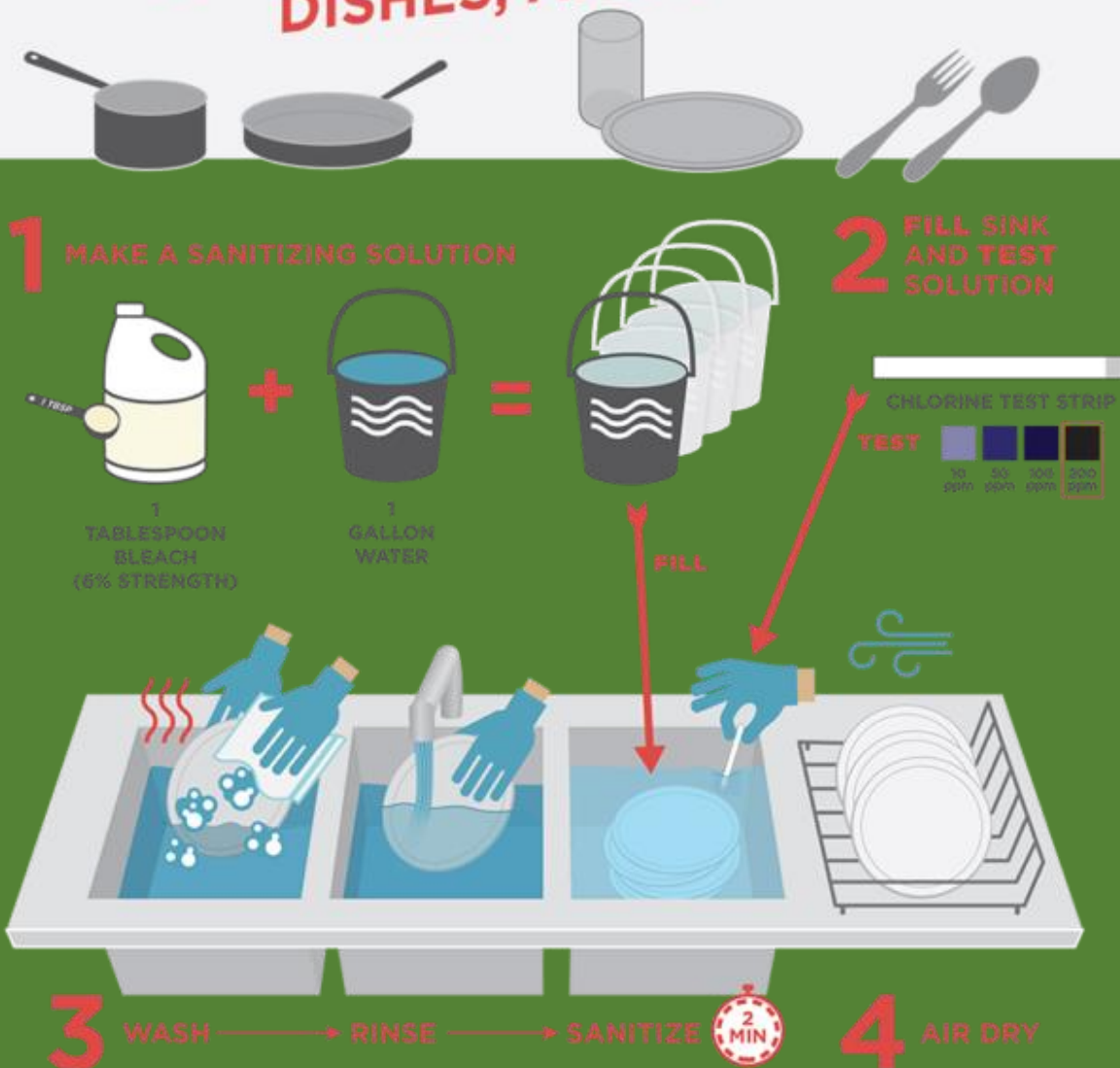


6 Dry your hands

DONT FORGET TO WASH:

- between your fingers
- under your nails
- the tops of your hands

Clean & Sanitize POTS, PANS, GLASSES, DISHES, AND UTENSILS



Scientific experts from the U.S. Centers for Disease Control and Prevention and the U.S. Food and Drug Administration helped to develop this poster.

Posters are available for download at www.waterandhealth.org/resources/posters



Bleach Dilution Chart



1 cup per gallon = 5000 ppm.
Extremely strong concentration used in hospital settings. Inappropriate for most home use.

2 tablespoons per gallon = 600 ppm. Appropriate dilution for disinfecting garden tools.

2 teaspoons per gallon = 200 ppm. Maximum dilution for commercial food preparation settings.

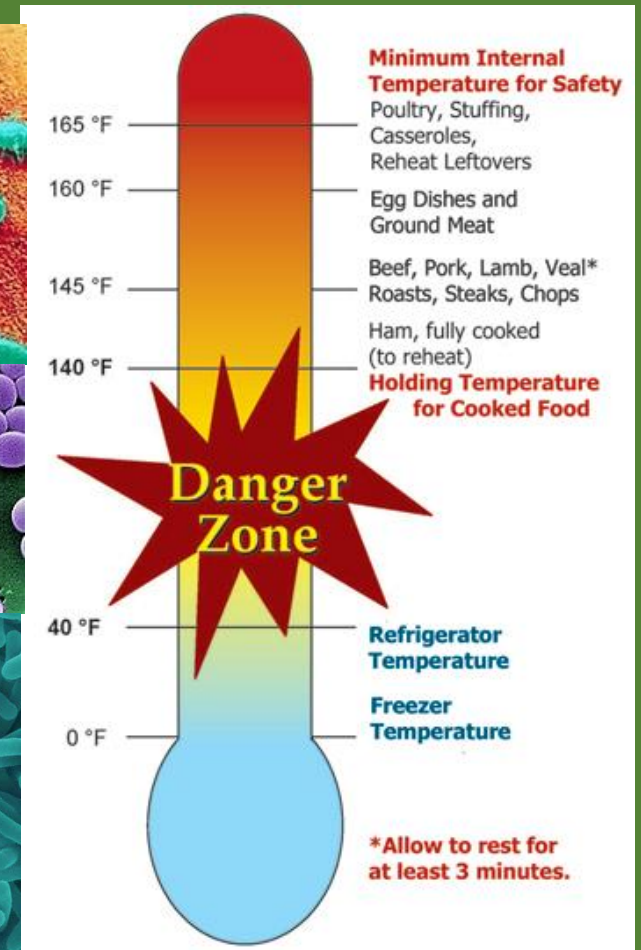
1 teaspoon per gallon = 100 ppm. Excellent dilution for general purpose hard surface sanitizing.

.5 teaspoon per gallon = 50 ppm. Minimum effective dose for general purpose hard surface sanitizing.

NORTHWEST EDIBLE LIFE | NWEDIBLE.COM

Temperature Safety

- When food temps (raw or cooked) enter the danger zone, all the bacteria in the air swarm, feed, and multiply – if food is not returned to the safe zones above 140° to 40° F within 2 HOURS, then the food must be disposed of; even foods returned to the safety zones are still tainted as bacteria leave behind toxins that cannot be cooked / chilled away
- Have a calibrated quick read thermometer readily available; sanitize after each use to avoid cross contamination; good thermometers go for \$5-\$7; do not use as candy or roasting thermometers – they will melt and need replacing



Cross Contamination

Raw meats and unpasteurized dairy have pathogens that spread via fluids on surfaces, utensils, and on yourself; sanitize surfaces after preparation, use different utensils for cooking and serving, and wash hands regularly

Avoiding Cross Contamination

There are many things you can do to avoid, or at least reduce, opportunities for cross contamination during food preparation and service. An important part of food safety is to impress upon your employees the importance of clean hands and clothing.

To avoid cross contamination by way of food-contact surfaces (e.i., cutting boards, knife blades, slicers, and preparation tables) an effective in-house cleaning and sanitation

Provide on going supervision to ensure employees remain clean and apply safe food handling practices when working with food

Once bacteria get on the surface, they can be difficult to remove. To avoid such a buildup, always clean and sanitize food-contact surfaces thoroughly before working with ready-to-eat foods and foods that will not be heat processed.

How to Prevent Cross Contamination?

- Cross contamination occurs when microbes and dirt from people, raw meat and raw fruit and vegetables, transfer to ready-to-eat foods, on utensils and equipment or through poor storage practices.
- Reduce cross contamination by:
 - Minimising hand contact with food
 - Separating raw and cooked foods
 - Using separate utensils to handle raw and cooked foods.



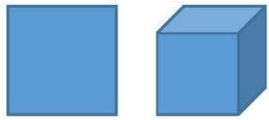
Kitchen Knives

- The basic knife set includes: a 8-12” French knife, a Boning knife, a Paring knife, a Peeler, and a Honing Steele
- Use the appropriate knife for your task; for most kitchen tasks the Chef’s, or French knife is used (comes in different lengths of 8-14”) – a French knife can substitute for most specialty knives for butchering, carving, and food prep; for butchering it’s best to use cleavers and boning knives; for carving cooked foods use carving and serrated knives; for Garde Manger and decorative work use a paring knife
- To sharpen your knives: use a whet stone and a honing steel; soak the whet stone in water or mineral oil, and move the blade several times against the coarse side first (fine side second) in a slight cutting motion, with the blade moving away from you; keep the angle of the knife at 20 degrees; when done on both sides of the knife, hold it in your dominant hand and move the blade down in a cutting motion against the steel in a 20 degree angle, alternating sides as you go; listen for a metal ringing sound – this means you’re doing it right; 4 or 5 passes on both sides is great



BASIC KNIFE CUTS

Large Dice – $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4}$ Perfect Cube



Medium Dice – $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ Perfect Cube
Macedoine



Small Dice – $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4}$ Perfect Cube



Brunoise – $\frac{1}{8} \times \frac{1}{8} \times \frac{1}{8}$ Perfect Cube



Fine Brunoise – $\frac{1}{16} \times \frac{1}{16} \times \frac{1}{16}$ Perfect Cube



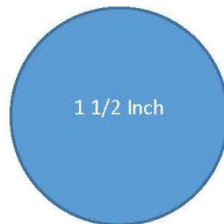
Paysanne – $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$
Scrabble Tile



Lozenge – $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$
Diamond Shaped



Rondelle



Fine Julienne – $\frac{1}{16} \times \frac{1}{16} \times 2-2 \frac{1}{2}$ "



End

Julienne – $\frac{1}{8} \times \frac{1}{8} \times 2-2 \frac{1}{2}$ "



End

Allumet – $\frac{1}{8} \times \frac{1}{8} \times 2-2 \frac{1}{2}$ "

End

1" Long

1 – $\frac{1}{2}$ "

2"

Batonnet – $\frac{1}{4} \times \frac{1}{4} \times 2 - 2 \frac{1}{2}$ "



Batonnet – $\frac{1}{4} \times \frac{1}{4} \times 3$ " Long Fries



BONBON BREAK



Large Dice



Medium Dice



Small Dice

BONBON BREAK



Fine Julienne



Brunoise



Fine Brunoise

BONBON BREAK



Batonnet



Allumette



Julienne

Utensils

- Working with the right tools can always make a difference
- Not necessary to buy or workshop fabricate every kitchen utensil; for example, a pillow case swung around will do as a salad spinner (this is how we did it in restaurants), a French knife can cut fresh pasta, dry kitchen towels work like oven gloves, a dowel for a rolling pin, etc.
- The basic pot and pan set includes: three saucepans (a two-pint, two-quart, and two-gallon - each with lids), two skillets (large and small); a medium sauté pan, a 12 gallon stock pot, and a large roasting pan



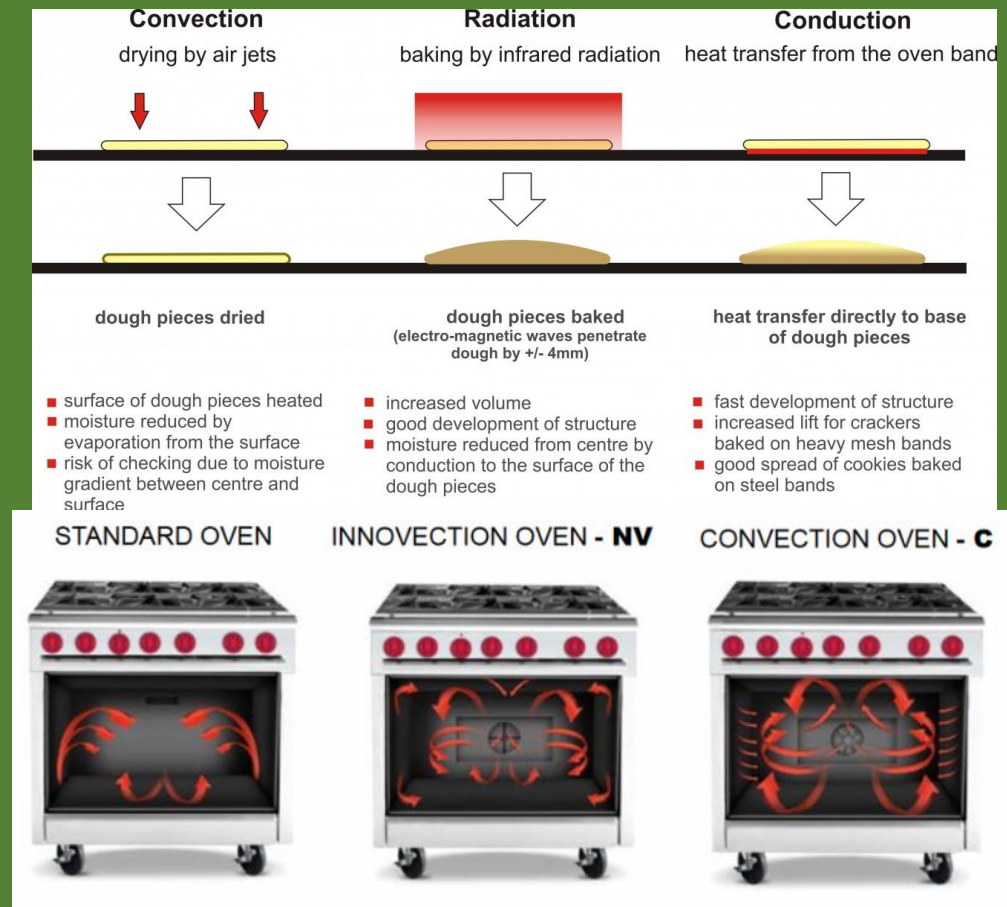


All of the pots and pans you should have in your kitchen

COOKWARE		USES	TIPS
	2-QUART SAUCE PAN WITH LID	Reheating soups Making sauces	Perfect for one person
	4-QUART SAUCE PAN WITH LID	Cooking larger stews and soups Making larger sauces	Perfect for 2-3 people
	6" AND/OR 10" STAINLESS STEEL SAUTÉ PAN	Go-to for stir fries, vegetables, braising, and finishing dishes	Make sure you have a lid
	8" NON-STICK SAUTÉ PAN	Cooking eggs and fish Allows you to cook at a lower temp	Don't use metal instruments because they will scratch the surface and get teflon in food
	8-QUART DUTCH OVEN WITH LID	Blanching, frying, poaching, and making casseroles Heats up evenly and goes from the stove-top to the oven to the table	Don't sauté food with the dutch oven
	10" CAST IRON PAN	Grilling meats, fish, and vegetables Can take high heat and go into oven	Cast iron won't tarnish and is easy to clean
	10" CAST IRON GRILL PAN	Has grooves in the bottom for searing meat Fat stays below in the grooves	Make sure to season and clean between the grooves

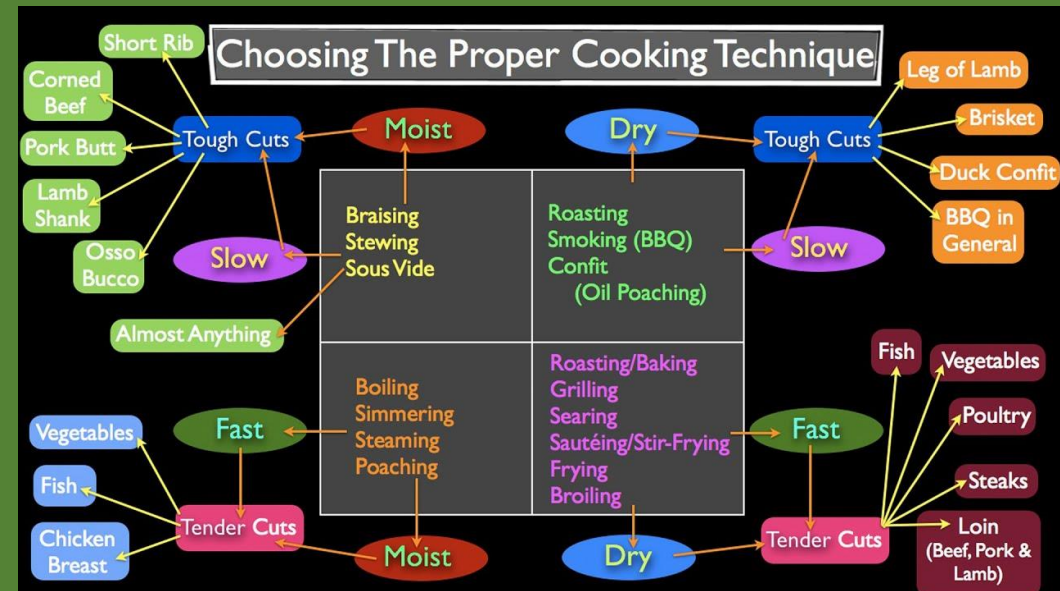
Range and Oven

- The heart of the kitchen; in separate sections or as one unit; ovens come in three standard types – convection, conventional (aka: conduction), and radiation via microwaves; ranges are either electric or gas
- Convection ovens use a fan that blows hot air around the food, cooking it more efficiently and faster; conventional uses only a gradual heating source to cook the food – better for delicate confections like chiffon and angel food cakes
- The standard convection oven temperature is 350° F, conventional ovens is 370° F – most foods bake and roast well at these temperatures
- Clean regularly



Cooking Methods & Techniques

- In professional cooking there's an unwritten rule that a great Chef is not afraid to give out their recipes, the reason being that a recipe and ingredients only counts for half a meal – the skill and methods of the Chef are what makes it great
- To a Chef, recipes are only measurements; professionals memorize cooking methods and techniques, and in this way can skillfully modify recipes and ingredients closer to the heart's desire; best to test foods by taste – flavor, consistency, etc.
- The infographic of methods on the next slide are worth memorizing to better cook and flavor dishes



cooking methods

	Equip.	Temp.	Time	Uses/Characteristics
Dry Heat	Bake/ Roast			Desserts, Breads, Meat, Vegetables Evenly distributed, indirect heat
	Broil/ Grill			Meat, Vegetables, Fruit Direct heat - Cook, Char, Sear, Crust
	Deep Fry			Desserts, Meat, Vegetables Crispy - requires submersing in fat
	Double Boiler			Chocolate, Custards, Sauces For delicate ingredients
	Pan Fry			Meat, Vegetables, Fruit Even cooking - requires a little fat
	Sauté			Meat, Vegetables, Fruit Searing - requires a little fat
	Sweat			Vegetables Used to extract flavor from items.
Moist Heat	Torch/ Flambe			Desserts, Meringues Flame or lit alcohol to char/sear
	Blanch			Vegetables, Fruit Two steps: 1. Boil, 2. Dip in ice water
	Boil			Pasta, Rice, Vegetables, Reducing Rapid, large bubbles
	Braise			Meat Tenderizes & intensifies flavor
	Poach			Meat, Vegetables, Fruit Infuses flavor, keeps shape
	Scald			Liquids, Milk, Custards For heating delicate ingredients
	Simmer			Liquids, Soups, Stocks, Reducing Infrequent, small bubbles
	Steam			Vegetables, Meat Most gentle & retains nutrients

mixing methods

	Uses	Tools	Mixer	Steps
Angel Food	light & airy			1. Sugar+Whites - whip to soft peaks. 2. Dry - fold into whipped SW.
Biscuit	flaky		X	1. Fat+Dry - pinch fat w/ fingers until crumbly. 2. Liquid - add to FD; mix until just combined.
Chiffon	moist & fluffy			1. Yolks+Fat+Liquid - whisk together. 2. Dry - add gradually to YFL; mix in well. 3. Sugar+Whites - whip to stiff peaks; fold in.
Creaming	moist & dense			1. Fat+Sugar - beat until light & fluffy. 2. Eggs - add one at a time; mix in well. 3. Dry+Liquid - mix in alternately.
Muffin	soft & crumbly		X	1. Dry+Liquid - add liquids to dry ingredients; mix until just combined.
One-Stage (one-bowl)	crumbly			1. Everything - add all ingredients together; mix until just combined.
Foaming (sponge)	spongy & airy			1. Eggs/Yolks+Sugar - whip to ribbon stage. 2. Dry - fold into whipped E/YS mixture. 3. Whites - whip; fold into E/YSD mixture. 4. Fat - fold into E/YSDW mixture.
Two-Stage (high ratio)	moist & tender			1. Fat+Dry - mix/cut the fat into the dry. 2. Liquid - slowly add to FD while mixing. 3. Liquid+Sugar+Eggs - slowly add; whip.
Sponge (bread)				1. Liquid+Dry+Yeast - mix; let ferment. 2. Remaining - knead.
Straight (bread)				1. Everything - combine; knead.

The Cooking Oil Comparison Chart

eating**RULES**
eatingrules.com

small bites
smallbites.andybellatti.com

Learn the science behind this chart:
<http://bit.ly/oilchart>



Breads

- Breads have two categories: yeast and quick breads
- For yeast breads: dry yeast needs warm water to activate, roughly 100-110° F; a handful of finished bread dough saved in a mason jar with some water and flour, which is used for bread the next day makes a basic sourdough (continue the cycle the next day); yeast breads require two risings - one after mixing, the second right before baking; slice the top of the loaf in the second raising to help with expansion; always wash your hands and sanitize surfaces to prevent cross contamination – yeast is alive and can cause illnesses
- For quick breads: these use baking soda or baking powder to leaven; baking soda leavens from moisture/acid exposure, baking powder leavens from heat exposure; these are your biscuits, muffins, cakes, cookies, pancakes, waffles, and eclairs; very little concern for cross contaminating other foods, but still best to observe sanitation
- For our area the high altitude recipe modifications works best





Day 1- Making your first starter with water and flour. Day 1- Starter will be sticky, don't add too much flour. Day 1- Just dry enough to form a ball of sticky dough. Day 1- Store in sealed glass container.



Day 3- The top surface may turn grey, but it is not mold. Day 3- Starter under grey surface is refreshed. Day 3- The refreshed starter is firmer than Day 1. Day 4- You should have bubbles and no more grey on the surface.



Day 4- Use the starter under the surface and refresh again. Day 4- Now your starter is a nice golden color. Day 4- Refreshing with flour and water. Day 4- Roll the starter between your hands.



Day 4- Fold and roll the starter until firmer. Day 4- Refreshed starter. Day 5- Refresh 1 tbsp. for future baking and the rest for your first loaf. Day 5- The dough will be sticky.



Day 5- The dough will rise, but not as much as regular wheat bread. Day 5- Form the loaf. Day 5- Turn out the loaf on a hot baking surface. Day 5- Slash the loaf to allow expansion during baking.



Day 5- Baking, the loaf rises a lot in the oven. Day 5- Baking, the loaf rises a lot in the oven. Day 5- Baking, the loaf rises a lot in the oven. Day 5- The loaf is ready. Let cool well before slicing.



Baking CONVERSION CHART

	1 CUP	1/2 CUP	1/4 CUP	3/4 CUP	1/3 CUP	2/3 CUP	1 TABLESPOON= 3 TEASPOONS
FLOUR	140 grams	70 grams	35 grams	105 grams	45 grams	95 grams	10 grams
GRANULATED WHITE SUGAR	210 grams	105 grams	50 grams	155 grams	70 grams	140 grams	14 grams
BROWN SUGAR (PACKED)	225 grams	110 grams	55 grams	170 grams	75 grams	150 grams	16 grams
POWDERED SUGAR	-	-	-	-	-	-	10 grams
BUTTER	225 grams	(1 STICK)	(1/2 STICK)	170 grams	75 grams	150 grams	14 grams
CORNSTARCH	120 grams	60 grams	30 grams	90 grams	40 grams	80 grams	7 grams
COCOA POWDER	100 grams	50 grams	25 grams	75 grams	35 grams	65 grams	6 grams
BAKING SODA	-	-	-	-	-	-	18 grams
BAKING POWDER	-	-	-	-	-	-	15 grams
SALT	-	-	-	-	-	-	18 grams
WATER	240 grams	120 grams	60 grams	180 grams	80 grams	160 grams	15 grams
MILK	245 grams	120 grams	60 grams	185 grams	80 grams	165 grams	15 grams
LEMON-ORANGE JUICE	240 grams	120 grams	60 grams	180 grams	80 grams	160 grams	15 grams
LEMON-ORANGE ZEST	-	-	-	-	-	-	6 grams
HEAVY CREAM	235 grams	115 grams	58 grams	175 grams	80 grams	160 grams	15 grams
YOGURT	250 grams	125 grams	60 grams	185 grams	80 grams	165 grams	16 grams
OLIVE OIL	220 grams	110 grams	55 grams	165 grams	75 grams	145 grams	13 grams
CHOCOLATE CHIPS	180 grams	90 grams	45 grams	135 grams	60 grams	120 grams	11 grams
MOLASSES	320 grams	160 grams	80 grams	240 grams	105 grams	210 grams	20 grams
SUNFLOWER SEEDS	140 grams	70 grams	35 grams	105 grams	45 grams	95 grams	9 grams

pastryandbeyond.com



Meats

- Meat from the store is cold aged and has added water and flavorings to raise the price, so when using fresh meat from your own animals add a little extra fat or marinate before use if the fresh meat seems too dense, tough, or less flavorful
- Beef and chevon are cooked between rare and well done; pork, poultry/fowls, and rabbit must be well done to avoid food born illnesses
- All parts of the animal are useful with the right tools: grinders turn meat trimmings into ground meat or sausage, bones into stock, fats rendered, and skin and joints into gelatin
- Eggs are a renewable “meat” cooked in a vast variety of methods; treat raw eggs same as raw meat



SAFE COOKING TEMPERATURES

as measured with a food thermometer

GROUND MEAT & MEAT MIXTURES

Beef, Pork, Veal, Lamb	Internal temperature 160°F
Turkey, Chicken	165°F

FRESH BEEF, PORK, VEAL & LAMB

145°F
with a 3 minute rest time

POULTRY

Chicken & Turkey, Whole	165°F
Poultry Parts	165°F
Duck & Goose	165°F
Stuffing (cooked alone or in bird)	165°F

HAM

Fresh (raw)	160°F
Pre-cooked (to reheat)	140°F

EGGS & EGG DISHES

Eggs	Cook until yolk & white are firm
Egg Dishes	160°F

SEAFOOD

Fin Fish	145°F or flesh is opaque and separates easily with fork
Shrimp, Lobster & Crabs	Flesh pearly & opaque
Clams, Oysters & Mussels	Shells open during cooking
Scallops	Milky white or opaque & firm

LEFTOVERS & CASSEROLES

165°F

IF YOU CAN'T AFFORD TO TIP...
YOU CAN'T AFFORD TO GO OUT AND EAT.
ifyoucantaffordtotip.com

The Ultimate Steak Guide



Blue

seared outside, 1 minute each side,
ensure all edges are sealed.
100% red centre.
Internal Temp: 10-29°C.
Should feel spongy with no resistance.



Rare

seared outside, 2 1/2 minutes each side.
75% red centre.
Internal Temp: 30-51°C.
Should feel soft and spongy with slight resistance.



Medium Rare

seared outside, 3-4 minutes each side.
50% red centre.
Internal Temp: 57-63°C.
Should feel fairly soft, fairly spongy and slightly springy.



Medium

seared outside, 4 minutes each side.
25% red centre.
Internal Temp: 63-68°C.
Should feel fairly firm and springy.



Medium Well - (Past the point of no return)

5 minutes each side.
Slight hint of pink.
Internal Temp: 72-77°C.
Should feel firm with a slight spring.



Well Done - (Waste of a good quality steak)

6 minutes each side.
100% brown throughout.
Internal Temp: 77°C+.
Should feel very firm and will spring back quickly.

**CaveTools.com**

Meat Smoking Guide

Receive your free copy of "The Grill Master's Essential Barbecue Recipe Book" at www.FreeBarbecueRecipeBook.com

Meat Type	Smoking Temp.	Target Internal Temp	USDA Min.	Suggestions					
Pork Butt/Shoulder	225-275°F (107-135°C)	195-205°F (90-96°C)	145°F (63°C)	Cook until tender when probed. Approximately 1.5 hours per pound					
Pork Tenderloin	225-325°F (107-163°C)	145-150°F (63-66°C)	145°F (63°C)	Wrap in a bacon weave to help keep it from drying out					
Pork Ribs	225-275°F (107-135°C)	195-205°F (90-96°C)	145°F (63°C)	Remember to remove the thick membrane on the bone side first					
Beef Brisket	225-275°F (107-135°C)	195-210°F (90-99°C)	145°F (63°C)	Estimate 1.5 hours per pound for smoking time					
Chicken	250-300°F (121-149°C)	165°F (74°C)	165°F (74°C)	Finish off over high heat 325°F for 20 minutes to crisp the skin					
Turkey	250-300°F (121-149°C)	165°F (74°C)	165°F (74°C)	Try brining for 24 hours prior to smoking for maximum moisture					
Fish	225-250°F (107-121°C)	145°F (63°C)	145°F (63°C)	Fatter fish like salmon & trout absorb smoke faster					
Wood Type	Flavor Strength	Flavor Profile	Pork	Ribs	Beef	Chicken	Turkey	Fish	Symbol Key
Alder	Mild	Sweet and musky smoke				•	•	✓	✓ Highly Recommended • Tasted and Approved
Almond	Medium	Nutty and sweet flavor, little ash	•	•	•	•	•	•	
Apple	Mild	Sweet, fruity taste	✓	✓	•	✓	•		FIVE STEPS to PERFECT BBQ <div> Marinate ↓ Inject ↓ Rub ↓ Smoke ↓ Sauce </div>
Apricot	Mild	Hint of sweetness and fruitiness	•	•	•	•	•	•	
Cherry	Mild	Fairly sweet and fruity	✓	✓	•	✓	•	•	
Chestnut	Mild	Slightly sweet and nutty smoke flavor	•	•	•	•	•	•	
Hickory	Strong	Sweet to Strong with heavy bacon flavor	✓	✓	✓	•	•	•	
Jack Daniel's	Strong	Made from Jack Daniel's barrels. Strong	✓	•	•	•	•	•	
Lemon	Medium	Tangy, citrus smoke with hint of fruitiness	•	•	•	•	•	•	
Maple	Mild	Somewhat sweet subtle flavor	•	•	•	•	•	•	
Mesquite	strong	Earthy smoke flavor	•	•	✓	•	•	•	
Mulberry	Mild	Sweet, tangy, blackberry-like flavor	•	•	•	•	•	•	
Nectarine	Mild	Mild and sweet smoke	•	•	•	•	•	•	
Oak	Medium	Traditional smoke flavor	•	•	✓	•	•	•	
Orange	Medium	Tangy, citrus smoke with hint of fruitiness	•	•	•	•	•	•	
Peach	Medium	Slightly sweet and woody flavor	✓	✓	•	✓	•	•	
Pear	Mild	Earthy flavor with a hint of fruitiness	•	•	•	•	•	•	
Pecan	Mild	Sweet and mild. Similar to hickory	✓	✓	✓	✓	✓	•	
Plumb	Mild	Mild and sweet smoke	•	•	•	•	•	•	
Walnut	Strong	Bitter; commonly mixed with other woods	•	•	•				

CAUTION: Do not smoke meat with Cedar, Cypress, Elm, Eucalyptus, Fir, Liquid Amber, Pine, Redwood, Sassafras, Spruce or Sycamore
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Vegetables

- Vegetables are different from meats in that vegetables are cooked for less time or not at all – the less the better to retain flavor, body, and nutrients
- When cooking vegetables as a side dish have them prepped and ready to go so as not to disrupt your cooking flow; cook last, just before the meat and starch dishes are ready
- When cooking vegetables as an accent for your meats; pack onions and garlic below the meat (not green onions), followed by other vegetables around the meat; if sautéing a dish, cook the vegetables in the meat's remaining fats and juices; don't cook green onions into dishes – sprinkle on top of finished plated foods, the heat will cook them just right
- The denser the vegetable, the longer the cooking time; the worst way to cook most vegetables not for soup or stew is boiling; steaming is good, but the water still robs the food of nutrients; the better methods are roasting and sautéing (for example, sweet corn oven roasted in the husk on highest heat for 30-40 minutes then shucked at the dinner table retains the highest amount of natural sweetness)

VEGETABLE COOKING TIMES & RECOMMENDATIONS

When cooking vegetables, fresh or frozen, it's recommended to use steaming to preserve vitamins and minerals to the maximum. Steaming also retains the nature look of the vegetable, adding aesthetic value to your dish.

Fresh/Frozen Vegetables

VEGETABLE	FRESH, COOKING TIME	FROZEN, COOKING TIME
	Mins	Mins
Beet, small roots, whole	11-13	13-15
Brussel sprouts, whole	3-4	4-5
Carrots, whole or chunked	2-3	3-4
Escarole, chopped	1-2	2-3
Green beans, whole	2-3	3-4
Onions, sliced	2-3	3-4
Parsnips, sliced	1-2	2-3
Peas, in the pod	1-2	2-3
Peas, green	1-2	2-3
Potatoes, whole, baby	10-12	12-14
Pumpkin, large slices or chunks	8-10	10-14
Sweet potato, whole, large	12-15	15-19
Tomatoes, whole	3-5	5-7
Turnip, chunks	2-4	4-6

Tips

- Cook vegetables until soft, but so they still have a bite to them (think green beans that remain firm rather than droopy).
- The cooking time is for small or medium amount of food. For large amount, please add more water and increase the time by 20-40%.

VEGETABLE

To Boil: In saucepan, heat 1 inch water to boiling, unless stated otherwise. Add vegetables. Heat to boiling; reduce heat to low. Cook for amount of time in chart; drain.

To Steam: In saucepan or skillet, place steamer basket in 1/2 inch water (water should not touch bottom of basket). Place vegetables in steamer basket. Cover tightly and heat to boiling; reduce heat to low. Steam for amount of time in chart.

To Sauté: In skillet, cook in butter or oil over medium-high heat for amount of time in chart.

To Bake: Heat oven to 350°F. Place vegetables in oven as directed. Bake for amount of time in chart.

To Roast: Heat oven to 425°F. Toss cut (unless stated otherwise) vegetables with about 1 tablespoon olive oil and season as desired. Place vegetables in baking pan. Roast for amount of time in chart.

BROUGHT TO YOU BY



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COOKSMARTS' GUIDE TO ENJOYING VEGETABLES

Here's your guide on how you can fill your diet with a whole variety of vegetables. Enjoy them in season for tastiest (and least expensive) results!

WAYS TO ENJOY

BEST IN



SAUTÉ



MICROWAVE



WINTER



STEAM



PURÉED SOUPS



SPRING



ROAST



SALADS



SUMMER





























































































BOIL



NOODLES



FALL

ACORN SQUASH  	ARTICHOKES  	ARUGULA  	ASPARAGUS  	BEETS  	BELL PEPPERS  	BOK CHOY  	BROCCOLI RABE  	BROCCOLI  
BRUSSELS SPROUTS  	BUTTERNUT SQUASH  	CABBAGE  	CARROTS  	CAULIFLOWER  	CELERY  	CHARD  	COLLARDS  	CORN  
CUCUMBER  	EGGPLANT  	ENDIVE  	FENNEL  	GREEN BEANS  	KALE  	LEEKS  	LETTUCE / MIXED GREENS  	MUSHROOMS  
MUSTARD GREENS  	OKRA  	ONIONS  	PARSNIPS  	POTATOES  	NEW / BABY POTATOES  	RADICCHIO  	RADISHES  	RUTABAGAS  
SNOW PEAS  	SUGAR SNAP PEAS  	SPAGHETTI SQUASH  	SPINACH  	SWEET POTATOES  	TOMATOES  	CHERRY / GRAPE TOMATOES  	TURNIPS  	ZUCCHINI / SUMMER SQUASH  

Fruits

- Cooking with fruits usually requires blanching and some form of sugaring or citrating (leaving in a mix of water and lemon or lime juice) while prepping to retain color and consistency – fruits heated up tend to fall apart, go ‘mushy’, and oxidize easier than vegetables
- If cooking or processing, fruits are best used for desserts, salads, drinks, and as preserves; whenever possible use fruits fresh and just cut up with some citrating from oxygen if needed
- Keep refrigerated as long and often as possible to retain freshness – never freeze without blanching



FRUIT CHART






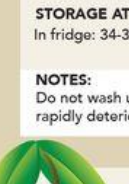
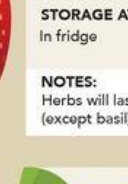


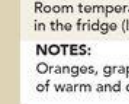
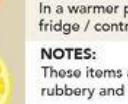
HEALTH BENEFITS OF YOUR FAVORITE FRUITS

 <p>APPLE</p> <p>Bone Protection, Lowers Cholesterol, Help Reduce Asthma, Diabetes Management, Alzheimer's Prevention, Lung Cancer Prevention.</p>	 <p>AVOCADO</p> <p>Heart Health, Stroke Prevention, Lower Cholesterol, Oral Cancer Defense, Beneficial for Eye Health, Breast Cancer Protection.</p>	 <p>CANTALOUPE</p> <p>Beneficial for Fever, High Blood Pressure, Obesity, Rheumatism, Abdominal and Stomach Gas, Arthritis, Skin Diseases, Constipation, Important Nutrient for a Healthy Vision, Stimulate White Cells to Fight Infection.</p>
 <p>POMEGRANATE</p> <p>Lowers Cholesterol, Fights Breast Cancer, Slows Prostate Cancer, Lowers Blood Pressure, Lung Cancer Prevention, Protect the Neonatal Brain, Prevention of Osteoarthritis.</p>	 <p>GRAPES</p> <p>Prevents Cataract, Also Benefits for Asthma, Preventing Breast Cancer, Control Blood Cholesterol, Prevents Kidney Disorders Prevent Blood Clots Thereby, Reducing the Chances of Heart Diseases.</p>	 <p>GUAVA</p> <p>Low in fat Calories, Guava is Rich in Fiber, Coronary Heart Diseases, Reducing the Risk of Cancer, It is Cholesterol and Sodium Free.</p>
 <p>LIME</p> <p>Beneficial for Skin, Detoxify the Body, Respiratory Disorders, Eye Care, Weight Loss, Helpful in Easing Constipation, Cure for Scurvy, Aid Primary Digestion, Help Healing of Peptic and Oral Ulcers.</p>	 <p>MANGO</p> <p>Heart Disease, Protect Against - Fever, Constipation, Respiratory Problems, Protect Against - Kidney Problems Including Nephritis.</p>	 <p>ORANGE</p> <p>Cancer Prevention, Help Protect the Skin, Reduce the Liver's - Production of Cholesterol- Lower High Blood Pressure, Protect Against Heart Diseases, Building a Good Immune System.</p>
 <p>PASSION</p> <p>Prevent Cancer, Help Our Bones, Improve Digestion, Prevent Heart Disease, Excellent Digestive Stimulant, Reducing the Symptoms of Asthma, Help Prevent Heart Attacks and Strokes.</p>	 <p>STRAWBERRY</p> <p>Strawberry is - Rich of Folic Acid, Skin Cleansing, Reduce Birth Defects, Strengthens and Heals the Gums, Clean the Blood of Harmful Toxins,</p>	 <p>PINEAPPLE</p> <p>Prevents Nausea, Dyspepsia, Bronchitis, Constipation, Arthritis, Catarrh, High Blood Pressure,</p>
 <p>WATER MELON</p> <p>Reduces the Risk of - Colon Cancer, Heart Diseases, Prostate Cancer, Rheumatoid Arthritis, Prostate Cancer, Help Reducing the Severity of Asthma, Protect Against Macular Degeneration.</p>	 <p>WOOD APPLE</p> <p>Blood Cleanser, Energy Booster, Prevents Scurvy, Good for Digestion, Effective for Ear-Aches, Good for kidney Patients, Good for Respiratory Problems.</p>	 <p>BELLI</p> <p>Mild laxative, Beneficial for - Digestive System, Used in the Treatment of Vitiligo, Treatment for Various Inflammations.</p>
 <p>RASPBERRY</p> <p>Helps Prevent Cancer, Inhibit the Growth of - Cancer Cells and Stop the Growth of Some Cancers.</p>	 <p>BANANA</p> <p>Heartburn Relief, Eyesight Protection, Reducing Depression, Reduce the Risk of Blood Pressure, Highly Protective to Kidney Health, May Reduce Risk of Kidney Cancer.</p>	 <p>PAPAYA</p> <p>Easily Digestible, Prevents Nausea, Prevent Constipation, Prevent Cancer in Organs, Glands with Epithelial Tissue, Helps Relieving Infection of the Colon.</p>



Ripe and Easy

A GUIDE TO PRODUCE RIPENING

 <p>AVOCADOS</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: On the counter until desired ripeness</p> <p>NOTES: Can be placed in fridge to slow ripening or to hold at desired ripeness</p>	 <p>PEARS</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: On the counter until flesh yields to light pressure</p> <p>NOTES: Pears can be held in fridge while unripe, then removed to begin ripening</p>
 <p>MELONS</p> <p>STORAGE AT HOME: Room temperature or in the fridge (longer life)</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: Watermelon, honeydew, cantaloupe, etc., although harvested ripe, room temperature may soften texture</p>	 <p>PINEAPPLE</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: Can dehydrate quickly in fridge; green on the shell does not mean under ripe</p>
 <p>STONE FRUIT</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: On the counter until desired ripeness</p> <p>NOTES: Peaches, nectarines, plums, apricots, etc. dehydrate in fridge; avoid if possible</p>	 <p>MANGO AND PAPAYA</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: On the counter until flesh yields to light pressure</p> <p>NOTES: Ripening can be slowed at lower temperature, but can become dehydrated; watch closely</p>
 <p>BERRIES</p> <p>STORAGE AT HOME: In fridge: 34-38°F</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: Do not wash until ready to eat; once washed, berries rapidly deteriorate</p>	 <p>HERBS</p> <p>STORAGE AT HOME: In fridge</p> <p>HOW TO RIPEN: No ripening needed</p> <p>NOTES: Herbs will last much longer in the fridge (except basil)</p>
 <p>CHERRIES</p> <p>STORAGE AT HOME: In fridge: 34-38°F</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: Do not wash until ready to eat; once washed, cherries rapidly deteriorate</p>	 <p>BASIL</p> <p>STORAGE AT HOME: Room temperature</p> <p>HOW TO RIPEN: No ripening needed</p> <p>NOTES: Basil is sensitive to cold; may turn black under refrigeration</p>
 <p>CITRUS</p> <p>STORAGE AT HOME: Room temperature or in the fridge (longer life)</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: Oranges, grapefruit, lemons, limes, etc. are tolerant of warm and cold - personal preference</p>	 <p>PEPPERS, CUCUMBER, ZUCCHINI</p> <p>STORAGE AT HOME: In a warmer part of the fridge / controllable drawer</p> <p>HOW TO RIPEN: Not needed - harvested ripe</p> <p>NOTES: These items are sensitive to cold - may become rubbery and dehydrated - 45 °F is ideal</p>

For more information, visit: LundsandByerlys.com/ProduceRipening

JewelPie

HOW TO CARVE A SWAN FROM AN APPLE

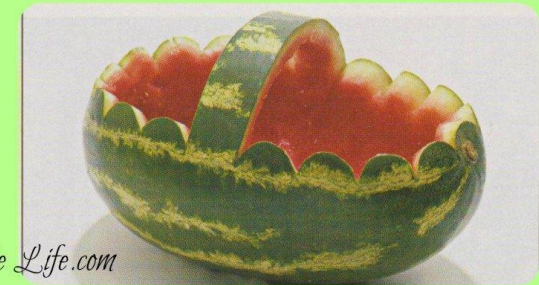
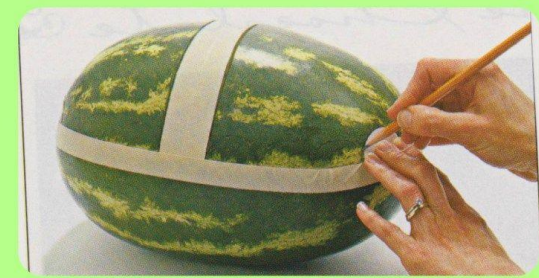


How To Carve a Watermelon Basket!

So Easy!

Just 4 Simple
Steps!

from Loving My New Simple Life.com



Seasonings

- Seasonings come in three categories: herbs (the non-fruiting part of the plant), spices (the fruiting/seed of the plant), and chemical (usually salts and glycerin)
- The flavonoids come from the plant's essential oils; extracting these oils came earlier in this primer
- Go through your seasonings and lightly smell and taste; imagine how the flavors would match, how they might work with other ingredients
- Seasoning chemically is best done by exact measurements provided by the manufacturer as it can have dangerous effects on the body.






















COOKSMARTS GUIDE TO FLAVORING WITH FRESH

HERBS

This Guide has everything you need to know about how to properly store and cook with fresh herbs. Use them to add flavor and freshness to your meals!

KEY	BASIL SWEET, PEPPERY	CHIVES MILDER-ONION	CILANTRO BRIGHT, CITRUSY	DILL GRASSY	LEMONGRASS ZESTY, CITRUSY	MARJORAM GRASSY, SLIGHTLY SWEET	MINT SWEET, COOL	OREGANO PUNGENT, PEPPERY
 PRODUCE								
 PROTEINS	Bell Peppers, Eggplant, Tomatoes, Zucchini	Potatoes, Asparagus, Onions, Leeks	Avocado, Tomatoes, Bell Peppers	Cabbage, Potatoes, Cucumbers, Carrots, Green Beans, Tomatoes	Bell Peppers, Tomatoes	Carrots, Mushrooms, Peas, Spinach, Zucchini, Tomatoes	Carrots, Eggplant, Watermelon, Mushrooms, Tomatoes, Potatoes, Zucchini	Artichokes, Bell Peppers, Eggplant, Mushrooms, Tomatoes, Potatoes, Zucchini
 USE IN	Chicken, Beef, Fish, Tofu	Chicken, Fish, Shellfish, Eggs	Chicken, Fish, Shellfish, Lamb, Lentils, Tofu	Fish, Shellfish	Chicken, Beef, Pork, Fish	Chicken, Beef	Beans, Lentils, Lamb	Chicken, Beef, Lamb, Fish
 HOW TO STORE	Pestos, Tomato Sauces, Soups, Stews, Stir Fries, Curries	Garnishes, Dips, Soups, Sauces, Risottos, Rice	Salsas, Guacamole, Chutneys, Soups, Curries, Salads	Omelets, Yogurt Dishes, Potato Salad, Sauces, Salad Dressings	Asian Soups, Rice, Curries, Marinades, Teas	Stuffings, Salad Dressings, Soups, Risottos, Brown Butter Sauce	Fruit Salads, Curries, Cream Sauces, Soups, Marinades	Tomato Sauces, Pizzas, Salad Dressings
	In a jar, countertop, for 7–10 days	Rolled in a damp paper towel, in the fridge, 10–14 days	In a jar, in the fridge, for 7–10 days	Rolled in a damp paper towel, in the fridge, for 10–14 days	Rolled in a damp paper towel, in the fridge, for 10–14 days	Rolled in a damp paper towel, in the fridge, for 10–14 days	In a jar, in the fridge, for 7–10 days	Rolled in a damp paper towel, in the fridge, for 10–14 days

PARSLEY FRESH, GRASSY	ROSEMARY WOODY, PUNGENT	SAGE WOODY	TARRAGON PEPPERY, LICORICE	THYME MINTY
				
Mushrooms, Peas, Potatoes, Tomatoes, Cucumbers, Zucchini	Mushrooms, Peas, Tomatoes, Potatoes	Brussel Sprouts, Eggplant, Peas, Winter Squash	Artichokes, Carrots, Leeks, Mushrooms, Potatoes, Spinach	Carrots, Peas, Potatoes, Winter Squash, Tomatoes
Lamb, Beef, Chicken, Fish, Tofu	Chicken, Lamb, Pork, Fish	Pork, Beef, Turkey	Chicken, Beef, Lamb, Fish	Chicken, Pork, Lamb, Duck, Fish
Sauces, Salads, Garnishes	Focaccia Bread, Tomato Sauces, Pizza, Soups, Stews, Roasted Veggies	Stuffings, Salad Dressings, Soups, Risottos, Brown Butter Sauce, Roasted Veggies	Omelets, Gazpachos, Salad Dressings, Garnishes	Rice, Dips, Stews, Roasted Veggies, Tomato Sauces
In a jar, in the fridge, for 7–10 days	Rolled in a damp paper towel, in the fridge, for 10–14 days	Rolled in a damp paper towel, in the fridge, for 10–14 days	In a jar, in the fridge, for 10–14 days	Rolled in a damp paper towel, in the fridge, for 10–14 days

HOW TO STORE FRESH HERBS

“PLANTING” METHOD

- 1 Trim the base of the stems with scissors or a knife
- 2 Fill a jar (an old condiment jar works great) about 1/3 to halfway with cold water
- 3 Place the cut stems into the water
- 4 Cover the jar with a plastic bag
- 5 Secure with a rubber band at the base of jar to enclose the bag around the jar
- 6 Place the “planted” herb in the fridge or leave it out on the countertop depending on the herb



TOWEL METHOD

- 1 Wrap the herbs in a damp paper towel
- 2 Put the wrapped herbs in a Ziploc bag
- 3 Place the herbs in the fridge





COOKSMARTS GUIDE TO FLAVORING WITH SPICES

Learn how to spice up your meals and add flavor to your foods with this comprehensive spice chart. Become a seasoning pro and never make a bland meal again!

KEY FLAVOR PROFILE	ALLSPICE EARTHY, SWEET	BASIL SWEET	CINNAMON EARTHY, SWEET	CLOVES EARTHY, SWEET	CORIANDER EARTHY, PEPPERY	NUTMEG SWEET	OREGANO EARTHY	PAPRIKA SWEET, WARM
 PRODUCE								
 PROTEINS	Apples, Beets, Cabbage, Carrots, Squash, Sweet Potatoes, Turnips	Bell Peppers, Eggplant, Potatoes, Tomatoes, Zucchini	Apples, Carrots, Pears, Sweet Potatoes, Squash	Apples, Beets, Squash, Tomatoes, Sweet Potatoes	Bell Peppers, Potatoes, Onions, Tomatoes	Broccoli, Cabbage, Carrots, Squash, Cauliflower, Sweet Potatoes	Artichokes, Tomatoes, Bell Peppers, Zucchini, Potatoes, Mushrooms	Bell Peppers, Squash, Cauliflower, Broccoli, Potatoes
 USE IN	Beef, Lamb	Cheeses, Chicken, Fish, Pork	Chicken, Lamb	Lamb	Chicken, Beef, Fish, Pork, Tofu	Lamb	Beans, Chicken, Fish, Lamb, Pork	Chicken, Shellfish, Lamb, Tofu
 PAIRS WELL WITH	Soups, Desserts, Breads	Salad Dressings, Sauces, Dry Rubs, Marinades	Fruit Sauces, Desserts, Breads	Curries, Soups, Marinades, Desserts, Breads	Curries, Soups, Sauces, Stuffing, Dry Rubs, Marinades	Rice, Stuffings, Sauces	Soups, Salad Dressings, Tomato Sauces, Dry Rubs, Marinades	Rice, Soups, Salad Dressings, Marinades
	Cardamom, Nutmeg, Cinnamon, Cloves, Ginger, Mace	Garlic Powder, Rosemary, Thyme, Marjoram, Oregano	Allspice, Cloves, Nutmeg	Cinnamon, Nutmeg, Allspice, Basil	Chili Powder, Cumin, Cinnamon	Allspice, Cloves	Chili Powder, Bay Leaves, Thyme	Garlic Powder, Chili Powder, Cardamom, Cinnamon, Cumin
BAY LEAVES BITTER	CARDAMOM SWEET	CAYENNE PEPPER SPICY	CUMIN SMOKY, EARTHY	GARLIC POWDER SAVORY	GINGER SWEET, WARM	ROSEMARY EARTHY	THYME EARTHY	TURMERIC PEPPERY, BITTER
								
Potatoes, Tomatoes, Mushrooms	Carrots, Citrus, Corn, Peas, Sweet Potatoes, Squash	Eggplant, Potatoes, Zucchini, Bell Peppers, Corn, Tomatoes	Eggplant, Tomatoes, Zucchini, Carrots, Corn, Green Beans	Cabbage, Tomatoes, Zucchini, Carrots, Mushrooms	Carrots, Citrus, Sweet Potatoes, Beets, Squash	Mushrooms, Peas, Potatoes, Onions	Carrots, Tomatoes, Zucchini, Cauliflower, Green Beans, Peas	Cauliflower, Cabbage, Potato, Sweet Potatoes
Beans, Lentils, Shellfish	Chicken, Duck, Lentils, Pork	Chicken, Beef, Fish	Beans, Chicken, Beef, Fish, Lentils, Pork, Tofu	Beans, Chicken, Beef, Fish, Tofu	Chicken, Beef, Fish, Pork, Tofu	Beans, Chicken, Lamb, Pork, Fish	Beef, Chicken, Fish, Lamb, Pork, Lentils	Beans, Lentils, Chicken, Fish, Tofu
Risotto, Soups	Curries, Rice	Rice, Soups, Salad Dressings, Sauces, Marinades	Curries, Rice, Soups, Sauces, Dry Rubs, Marinades	Curries, Soups, Sauces, Stir-Fries, Dressings, Dry Rubs, Marinades	Rice, Curries, Stir-Fries, Marinades	Marinades	Soups, Salad Dressings, Dry Rubs, Marinades	Curries, Rice
Oregano, Sage, Thyme, Marjoram	Cinnamon, Cumin, Ginger, Turmeric	Cumin, Paprika, Cinnamon	Garlic Powder, Turmeric, Ginger, Cinnamon, Oregano	Oregano, Cumin, Coriander, Turmeric	Garlic Powder	Garlic Powder, Oregano, Thyme, Basil,	Oregano, Rosemary	Cardamom, Garlic Powder

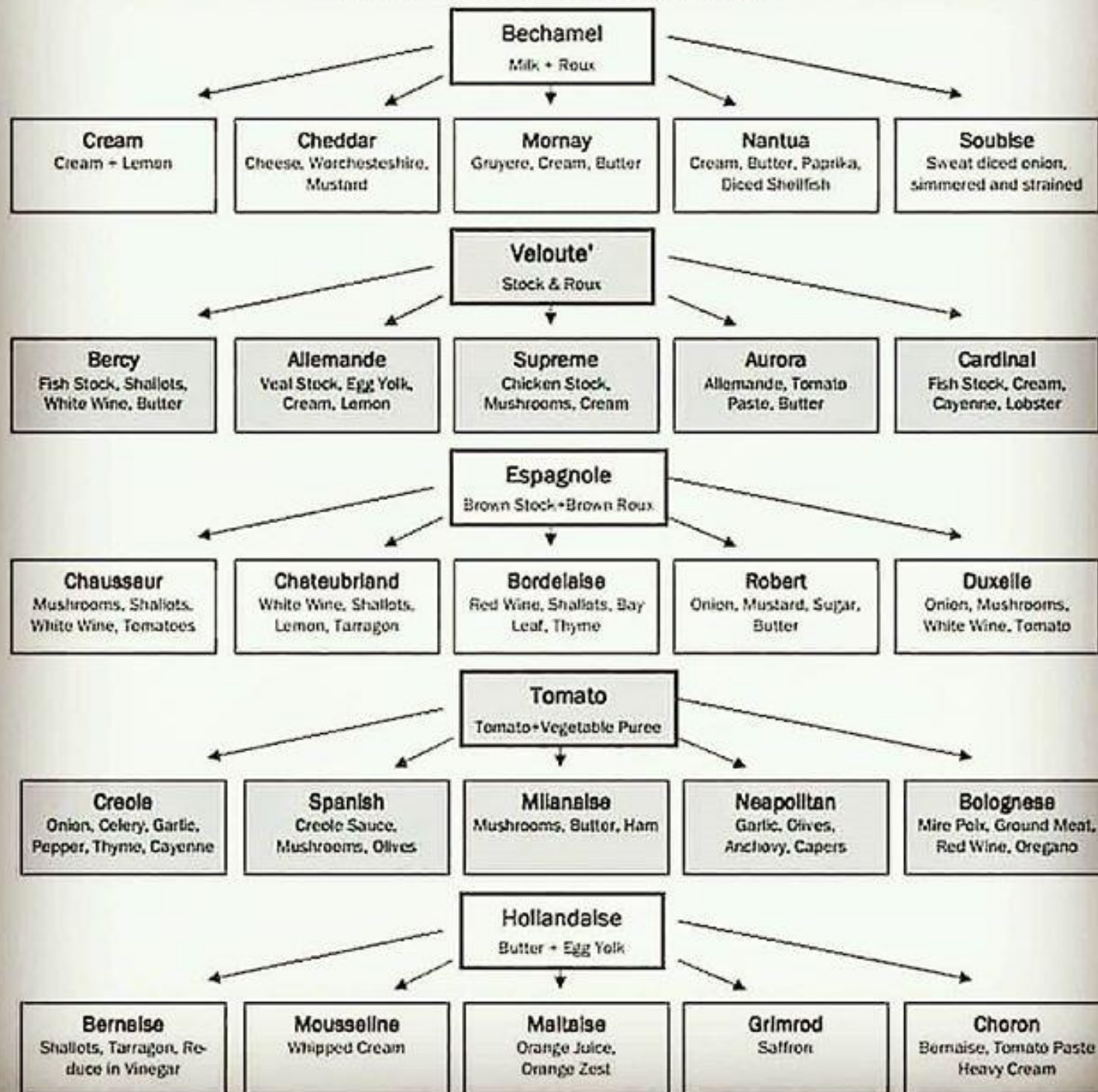
Sauces

- Sauces enhance the dish, gives accents to flavors, gives off needed moisture to foods that dry out in the heat, and help with presentation
- There are tens of thousands of sauce variations based on what type of mother sauce is used, what seasonings, wines, or cheeses added, and the temperature the sauce is served
- The traditional thickener for sauces is roux – a combination of equal parts fat and flour; add to your stock or cream and your sauce thickens with heat; simmer for 15 minutes or longer until you can no longer taste the flour in the sauce
- Practice making mother sauces and use their tastes, aromas, and textures to craft your own recipes



Mother Sauces Flow Chart

www.instagram.com/chefler_platformu



Leftovers

- Good cooks make great leftovers; great chefs make more ingredients for another meal
- A fine example is the whole roast chicken: carved and served first; leftovers are uneaten meat pieces, bones, and drippings/gravy – meat pieces made into salads, soup, casseroles, or sandwiches; the bones boiled and simmered to extract the flavors and gelatin for stocks, soups, sauces, and glazes; the leftovers from these can further be processed into forcemeats and sausage meats; and the leftovers from these become feed for fowls and poultry in the garden
- Used soup bones go into crafts, charcoal, and fertilizers



Candy Making

- Chocolates: a variety of flavors (milk, dark, white, etc.) and forms (molded, syrup, modeling, baking, etc.); always melt chocolates in a double boiler for radiant heat – prevents burning and scolding; molded chocolates should be tempered; growing and processing cocoa beans in our Ward area is not impossible but very difficult – especially for needed greenhouse space and equipment, so it's best to store large amounts of cocoa powder beforehand

- Cooking Sugar: to melt sugar, start in a saucepan on medium heat, combine water and sugar, insert candy thermometer, and cover with aluminum foil; the water will eventually boil out leaving only liquid sugar – when this happens you can leave the foil off; pull pan off the heat and pour out at the right temperature for the recipe; jawbreakers are made with a candy or bubble gum center tumbled in a cement mixer with hot melted sugar ladled in to create layers

- Gelatins: safer done in a double boiler, but slower to get results (if it burns, gelatin smells like burning hair); bloom the gelatin in some warm water before cooking; flavor and coloring are not as difficult to do as sugar

- Don't be afraid to experiment and try out new methods; all candies on the market had their start in the home kitchen – even bubble gum, jaw breakers, chocolate bars, and gummy worms; Mrs. Cavanaugh's chocolate company began as a Relief Society project

SALT WATER TAFFY
oldrecipebook.com
2 cups granulated sugar
1 cup light corn syrup
1½ teaspoons salt
2 tablespoons butter
or margarine
¼ teaspoon oil of peppermint
7 drops green food coloring

Combine sugar, syrup, salt, and 1½ cups water in 2-quart saucepan. Cook slowly, stirring constantly, till sugar dissolves. Cook to hard ball stage (260°) without stirring. Remove from heat; stir in remaining ingredients. Pour into buttered 15½x10½x1-inch pan. Cool till comfortable to handle. Butter hands; gather taffy into a ball and pull. When candy is light in color and gets hard to pull, cut in fourths; pull each piece into long strand about ½ inch thick. With buttered scissors, quickly snip in bite-size pieces. Wrap each piece in waxed paper. Makes 1¼ pounds.

Consistency	Temperature (F)	Test	Uses
Soft ball	234° to 240°	Syrup forms a soft ball when dropped into cold water; ball flattens when removed	Fudge, Penuche
Firm ball	244° to 248°	Syrup forms a ball when dropped into cold water; ball does not flatten when removed	Caramels
Hard ball	250° to 266°	Syrup forms a ball when dropped into cold water; hard enough to hold its shape, yet still plastic	Popcorn balls, Divinity
Soft Crack	270° to 290°	Syrup separates into threads when dropped into cold water; threads are hard but not brittle	Butterscotch, taffy
Hard crack	300° to 310°	Syrup separates into threads which are hard and brittle when dropped into cold water	Peanut Brittle
Caramel	338°	Barley sugar becomes brown	Flavor and color

Tempering Chocolate

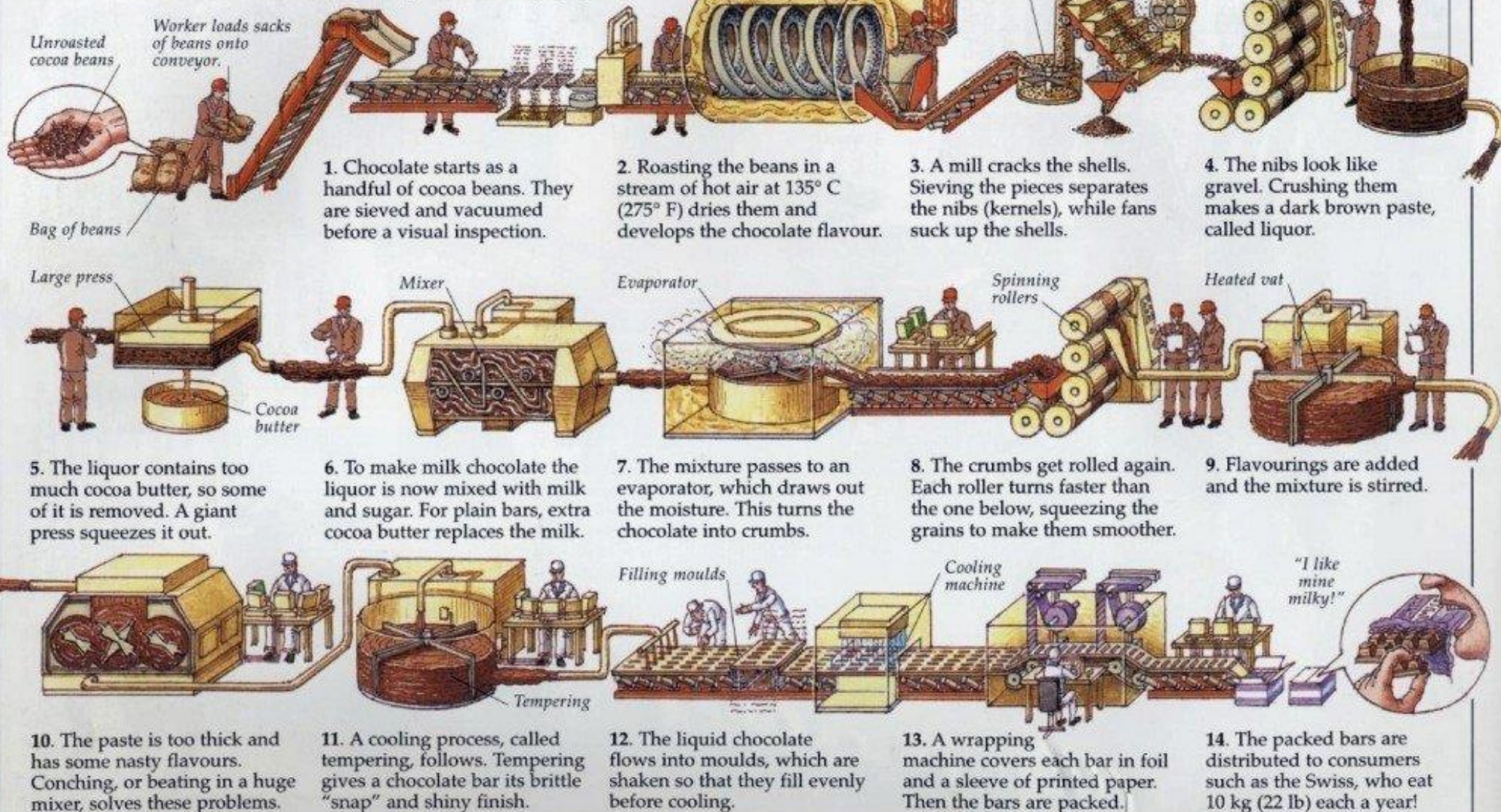
Tempering Chart:	Milk Chocolate	Dark Chocolate
Melting	113 - 118° F (45 - 47.7° C)	131 - 136° F (55 - 57.7° C)
Crystallization	81 - 82° F (27.2 - 27.7° C)	82 - 84° F (27.7 - 28.8° C)
Working (Tempered)	84 - 86° F (28.8 - 30° C)	88 - 90° F (31.1 - 32.2° C)





CHOCOLATE BAR

Until the early 1900s, chocolate was an occasional treat. But during World War I (1914-1918), bars were packed into soldiers' rucksacks, making it universally popular.



**Give a man a fish and he'll eat for a day,
teach a man to fish and he'll eat for a
lifetime...**

**Teach a man agriculture and the whole
neighborhood gets carrots, and beets,
and tomatoes, and zucchini, and...**



Non-Food Production/Manufacturing

Manufacturing is the making of goods or wares (practically anything) by manual labor or machinery, especially on a large scale

The Prophets and Apostles have asked us to prepare to create our own necessities in times of emergency – not wait to start learning these things during a crisis situation

The sooner we begin, the better off we'll all be

As with everything, do your own research and seek advice before trying it out for yourself



Manufacturing Begins with the Garden

- The majority of raw materials can come from your own plot of land
- Materials like stone, sand (silicates), clay, aluminum, iron, copper, salts, acids, etc. are in great supply with our proximity to the Oquirrih Mountains
- Our heavy clay loam is useable for earthenware pottery
- Plenty of homes in our area were built on landfills from the late 1800's to the 1950's; there's a lot of metals either still usable or as minerals in the soil
- The rest of the materials discussed will come from either waste products or purchased inexpensively
- Call Blue Stakes at 811 before digging



Mining Basics

- Mining requires separating and refining minerals and metals from the ground – all soils in West Valley are rich in minerals
- A simple set of panning tools is all that's needed, but larger equipment is really nice for mineral rich soil
- Metal detectors, dry washers, retorts, augers drills, dredges, & excavators makes the process faster but can raise the cost
- Separate minerals by first rough crushing, sieving, and dry washing to rough separate; then by further crushing and washing through a water dredge is fast, or leaving soil in a bucket of water to separate also works, but takes time; next step of refining may require a foundry and/or chemical separation
- Do not use explosives!!
- Call Blue Stakes at 811 before digging



Pottery

- Our heavy clay soil is an abundant supply of potter's clay; not the industrially refined version, but good enough for our needs
- To start: dig a shallow trench about 1 foot deep and allow water to continuously flow into it; when the water begins to stay for hours without absorption, the clay is ready for processing
- Take a large clump of clay and remove all impurities: rocks, twigs, hard lumps (keep these lumps! more on that later); make a few small disks of cleaned clay, dry them out, and then fire in the kiln; crush these disks into a coarse powder and mix into the larger amount of clay as a binder; the clay is now ready for making pottery
- The simplest method is pinching, but throwing on a wheel and extruding by hand create much better ceramics
- Fire in a kiln until the pottery itself is red hot; let it cool naturally and test by flicking it with your finger for a tell-tell bell sound; also, spit on it to see if the ceramic turns back into clay



Throwing on the Wheel

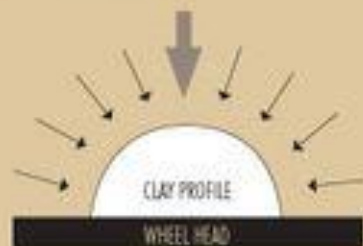
by Joke Allee

TIPS FOR SUCCESS

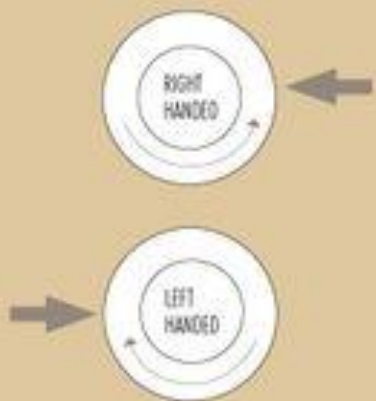
- ▶ Always apply and release pressure to the clay slowly.
- ▶ Never allow water to collect in the bottom of the piece.
- ▶ Slow the wheel down in each step of the process.
- ▶ Be persistent in your efforts.



Diagram illustrating hand to clay pressure.



Large arrow indicates hand to clay contact area when throwing. Small arrow indicates wheel direction.



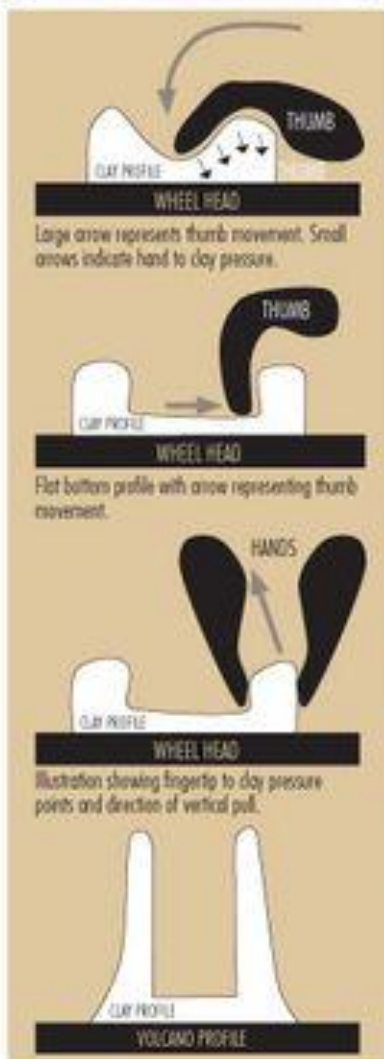
CENTERING THE CLAY

- ▶ Start with a well wedged ball of clay that's no larger than the size of your hands.
- ▶ Anchor your elbows to your knees for stability.
- ▶ Wet your hands and the clay.
- ▶ Slowly apply downward pressure equally to all sides of the clay until no movement exists within the mass.
- ▶ When the clay is "centered," it will be spinning while your hands remain still.
- ▶ Once the clay is centered, relax and slowly pull your hands away.



OPENING UP THE CLAY

- ▶ Place the tip of your thumb in the center of the clay mass.
- ▶ Slowly roll your thumb into the center of the clay maintaining pressure on the clay profile.
- ▶ Stop ½ inch from the wheel head.
- ▶ To create a flat bottom, use the same hand position and pull straight back toward yourself.
- ▶ Any movement causing the piece to go out of "center" is reflected in the rest of the piece.



MAKING A PULL

- ▶ From this point on, manipulate the piece only at the 3 o'clock position relative to the wheel head (9 o'clock if left handed).
- ▶ Slowly apply and release pressure.
- ▶ Always use your fingertips when making a vertical pull and slow the wheel down.
- ▶ Position your inside finger slightly above the outside finger and apply pressure with the outside finger slowly moving your hands upward.
- ▶ When making a vertical pull, pull the clay inward to create the volcano shape.
- ▶ Repeat the pulling process until the wall is uniform in thickness from top to bottom.

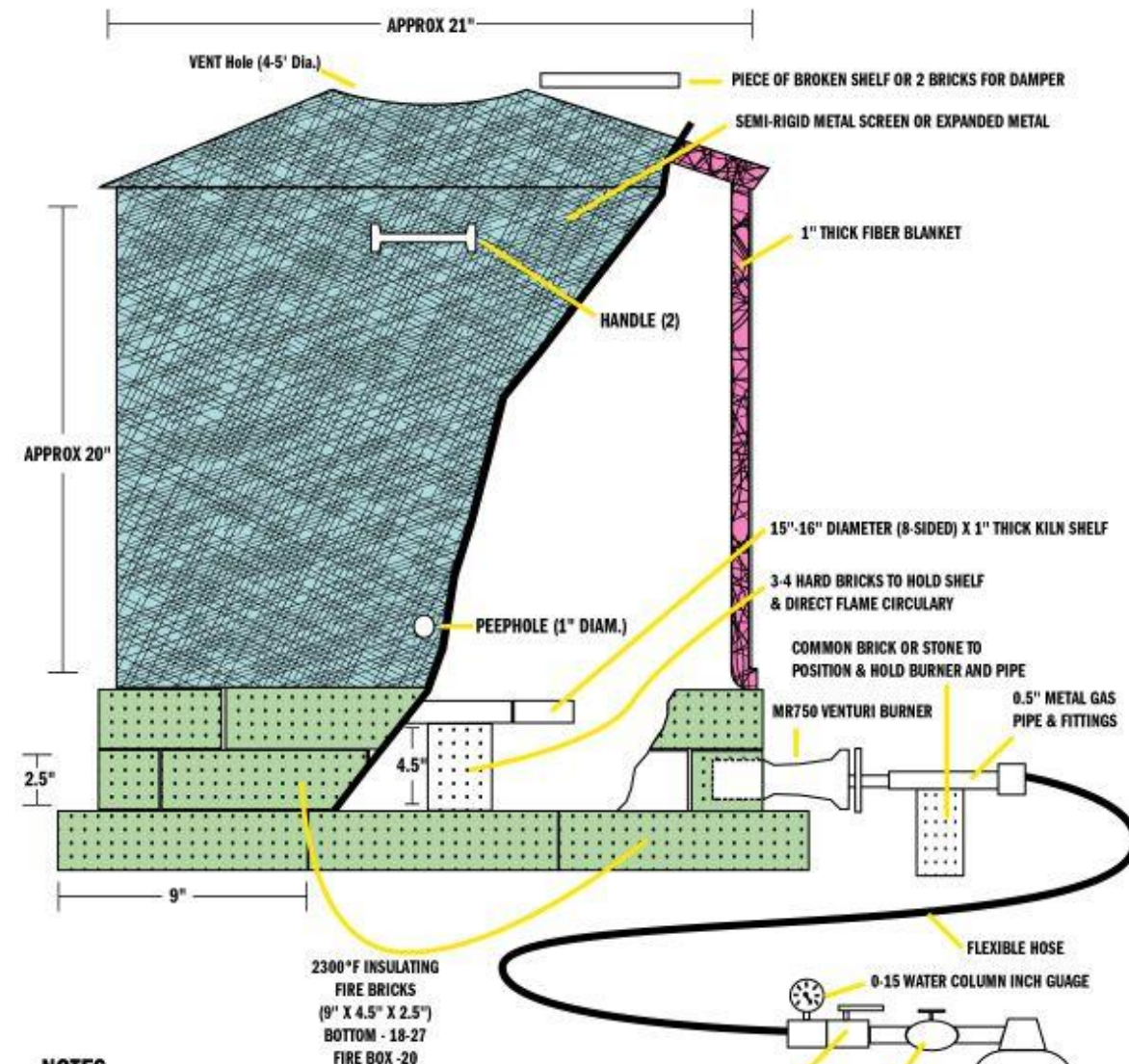


Pottery Types Characteristic of the Various Archaeological Periods

Period	640 C.E.
Byzantine Period	
330 C.E.	
Roman Period	
63 B.C.E.	
Hellenistic Period	
330 B.C.E.	
Persian Period	
586 B.C.E.	
Iron Age II	
930 B.C.E.	
Iron Age I	
1200 B.C.E.	
Late Bronze Age	
1550 B.C.E.	
Middle Bronze Age II	
1850 B.C.E.	
Early Bronze Age	
3100 B.C.E.	
Chalcolithic Age	
4000 B.C.E.	

RAKU KILN

SIMPLISTIC FUNCTIONAL/CONCEPTUAL OVERVIEW



NOTES

- THIS IS MEANT AS A GUIDE ONLY
- SIZE DETERMINED BY KILN SHELF SIZE
- OVERLAP FIBER ENDS
- LEAVE EXTRA FIBER ON BOTTOM TO FORM A SEAL
- DOME THE TOP FOR RIGIDITY
- OLD ELECTRIC KILN CAN BE GUTTED AND/OR MODIFIED EASILY TO SAVE MONEY. THE BRICKS WITH ELEMENT GROOVES PROVIDE AMPLE INSULATION
- USE NICHROME WIRE TO FASTEN METAL SCREEN ENDS AND KILN TOP TO KILN BODY

ATTACH FIBER EITHER:

1) WITH CLAY BUTTONS AND NICHROME WIRE



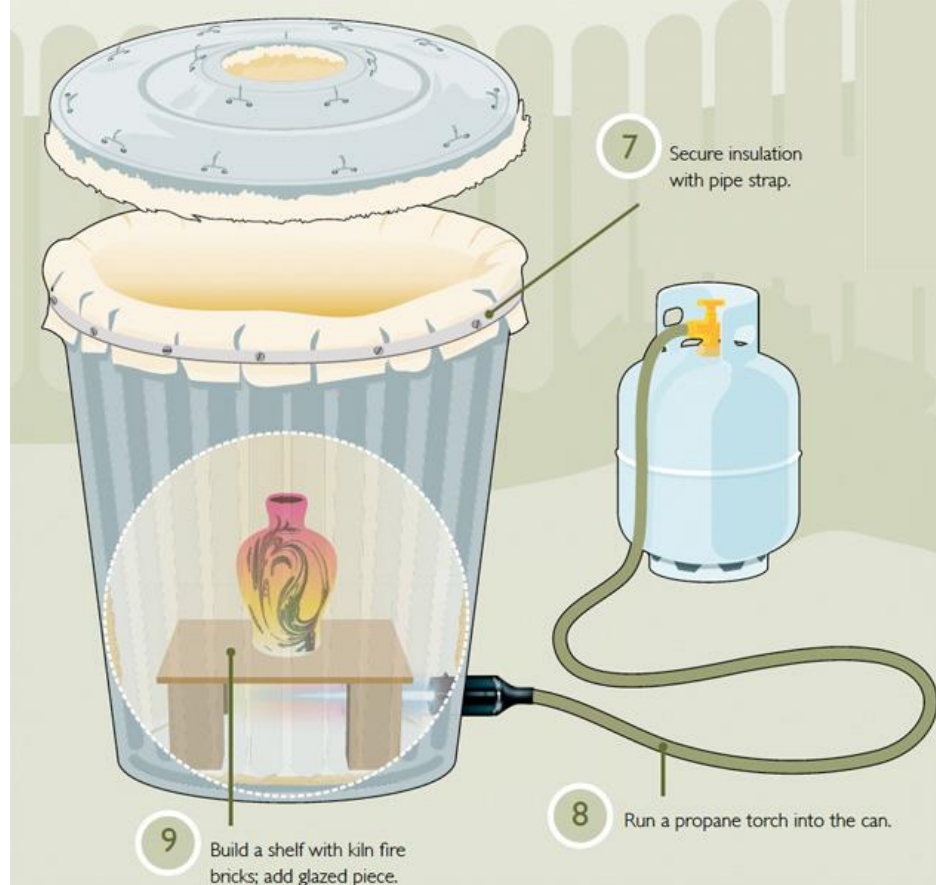
2) BY JUST LOOSELY "SEWING" THE FIBER WITH 8"-10" STITCHES, GENTLY PRESSING THE STITCH INTO THE FIBER

SHUT-OFF VALVE

REGULATOR
(adjustable preferred)

ABOVE NOT TO SCALE

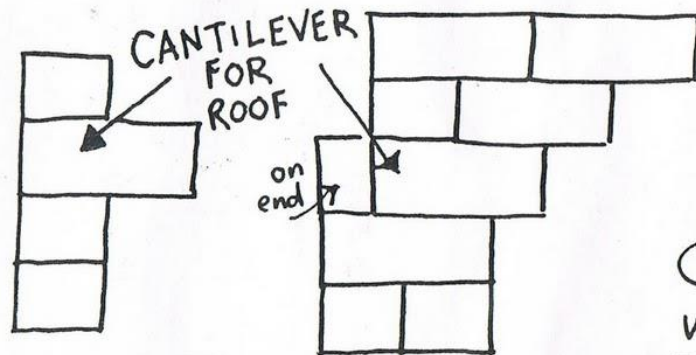
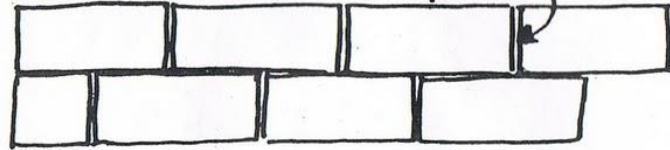
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TWO SMALL KILNS SUITABLE FOR LOW FIRING

NOTES, PLANS.

NORMAL OVERLAPPING OF JOINTS



Any bricks will be suitable: temp. upto 1000°C

Prefer firebricks: especially for firebox

Level site: can be raised on concrete blocks

No mortar needed (clay and sand if wanted)

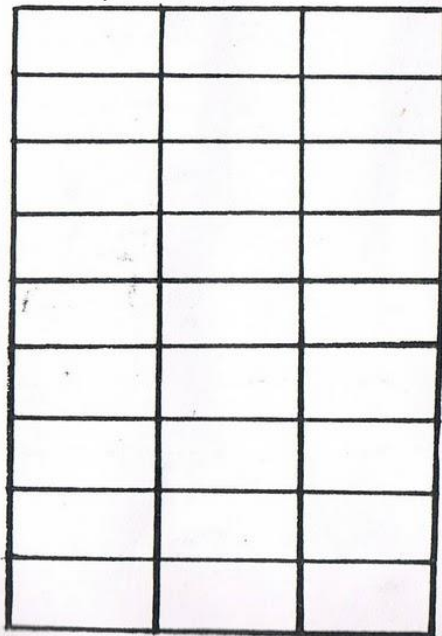
Door: Removable loose bricks or Fibre backed with

Fuel: Both kilns can burn thin metal sheet.

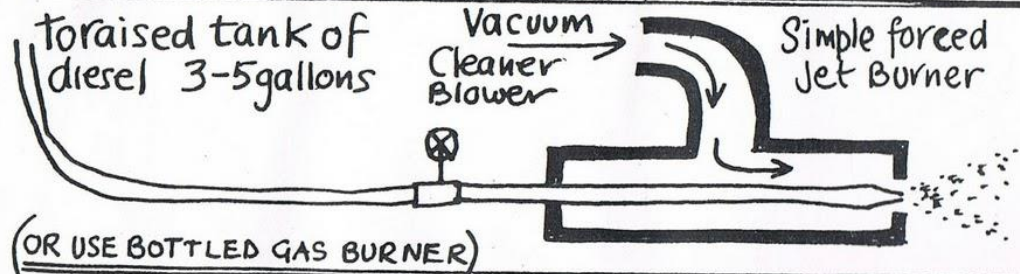
wood and coal to supplement diesel or gas.

Chimney: not essential but can be built with extra bricks or use a steel pipe.

KILN ADAPTED FROM PAUL SOLDNER DESIGN



BASIC COURSE

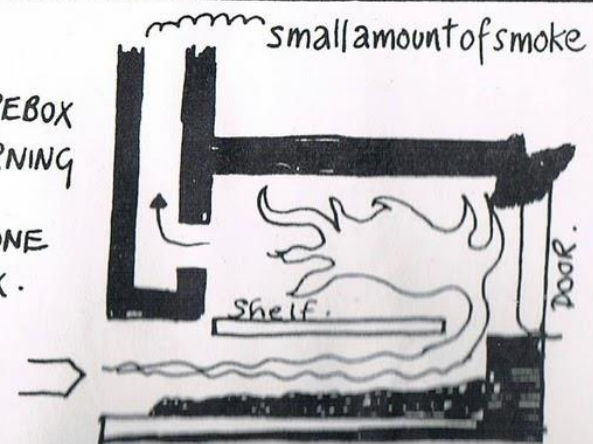


FIRING

LIGHT A WOOD FIRE IN FIREBOX
SPRAY DIESEL ONTO BURNING
WOOD EMBERS.

STOKE TO KEEP ABOUT ONE
THIRD SOLID FUEL IN BOX.

FROM RED HEAT KEEP A
SLOW LAZY SLIGHTY
SMOKY FLAME!



Paint

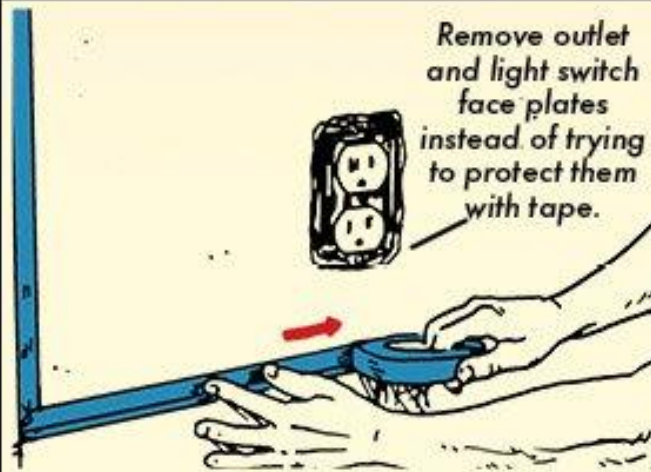
- The hard clumps removed from the raw clay that were not sedimentary stones may be concentrated iron oxide clay deposits called Oquirrh
- These deposits are lightly dry scrubbed to remove the dull clay on the outside; crush the Oquirrh in a mortar to as small particles as you can, then add water to dilute it and sieve the liquid to remove impurities; save the liquid and dehydrate; then crush the remaining fine deposit again; when ready to use: whisk in vegetable oil, fish oil, or water with a little vinegar until smooth in consistency
- Heat the powder in a skillet over high heat to change the color; yellow to red to burgundy to brown



How to Paint a Room



1. Clear the room of pictures, furniture, and other items that can get in your way. Move heavy furniture to the center.



2. Use painter's tape to protect the ceiling and trim pieces along the floor, and around doors and windows. Lay a drop cloth to protect floor and furniture.



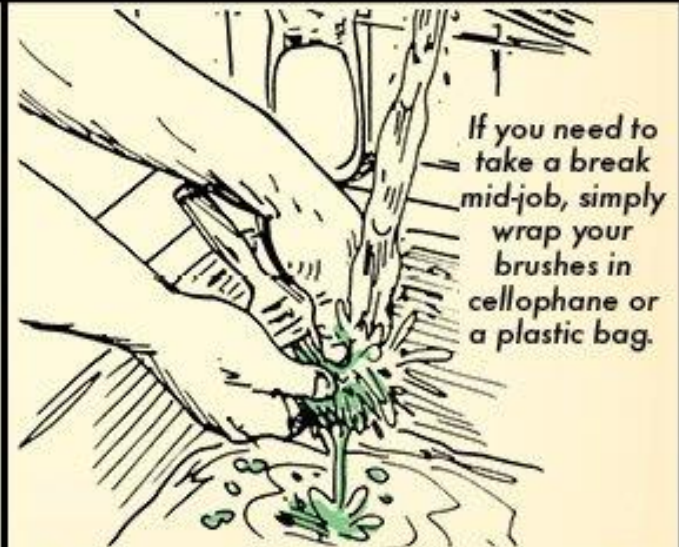
3. Use a roller to paint the walls, working from top to bottom so you can fix drips as you go along.



4. Use a brush to get corners, edges, and areas close to outlets and light switches.



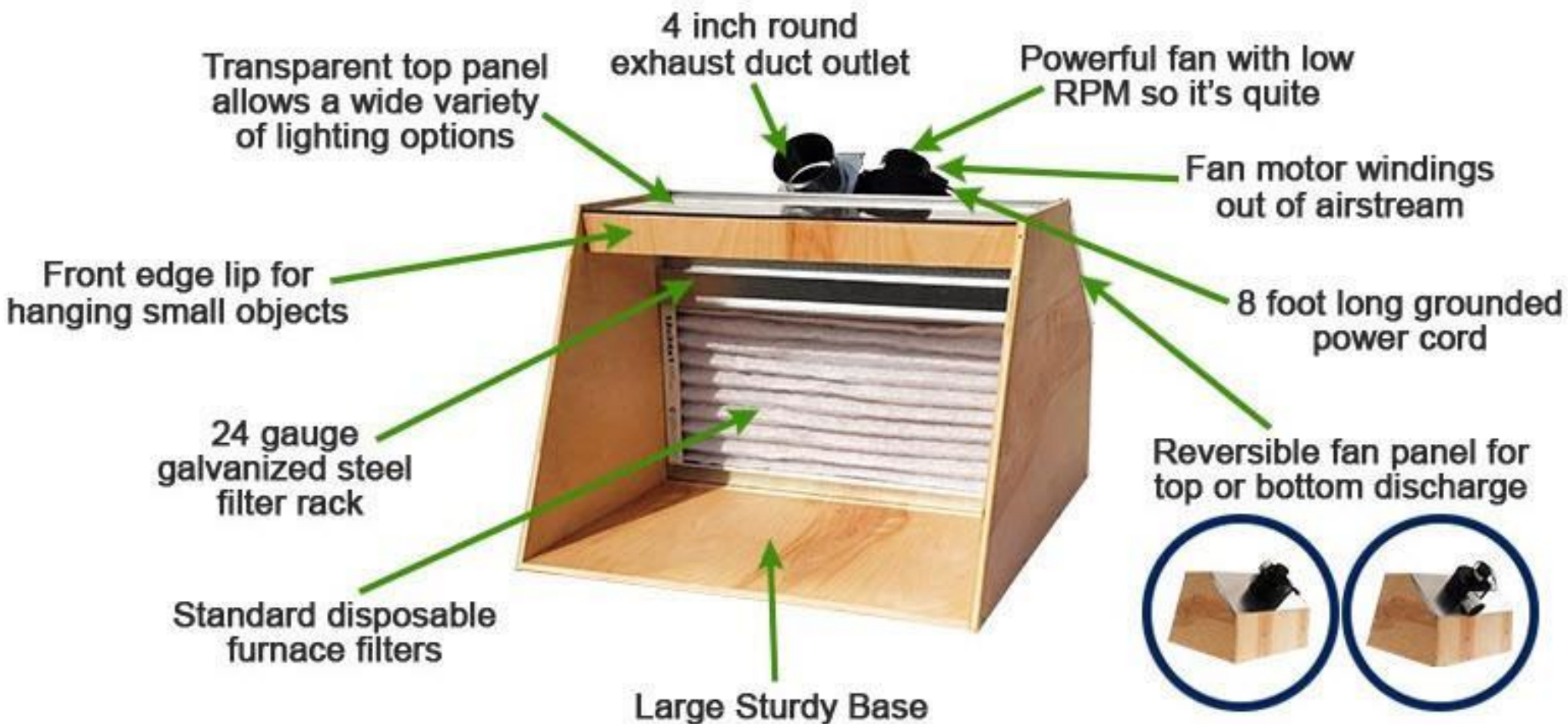
5. Apply a second coat, and immediately remove the tape. Waiting for the paint to dry can result in peeling.



6. Clean up by rinsing your brushes and rollers with warm water, then leave them out to dry.

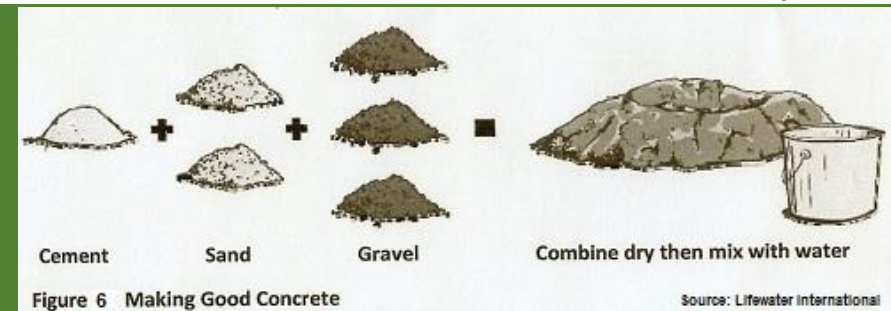
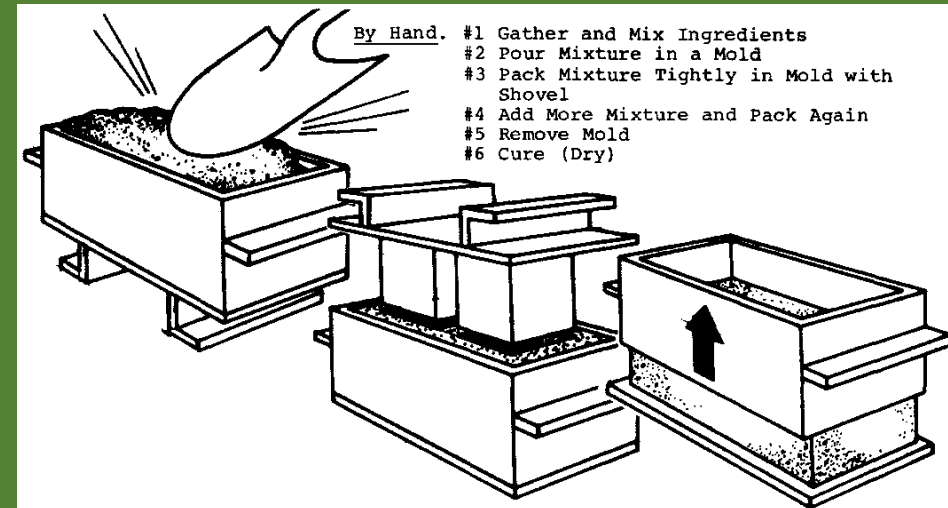
BUILD YOUR OWN SPRAY BOOTH

Do it right the first time with our DIY Hobby Spray Booth



Stone, Bricks, and Cement

- Gardens naturally grow rocks and stones (pushed up from the bedrock and subsoil by winter freezes expanding groundwater); after removing them from the garden, use them for paving and building projects for the home
- Basic cement is a mix of sand and quicklime; many different varieties of cement exist for different applications are on the market; do your research before purchasing – using the correct cement for a project will save you a lot of time and headaches
- Cement and concrete work just like silicone: requires a negative mold (the opposite of the shape you're trying to reach), pour when the consistency is right, let it dry and cure before removing from the mold; the difference is cement and concrete require vibration for force out air bubbles that weaken the structure
- Most stones you'll find in the garden are large sedimentary rocks

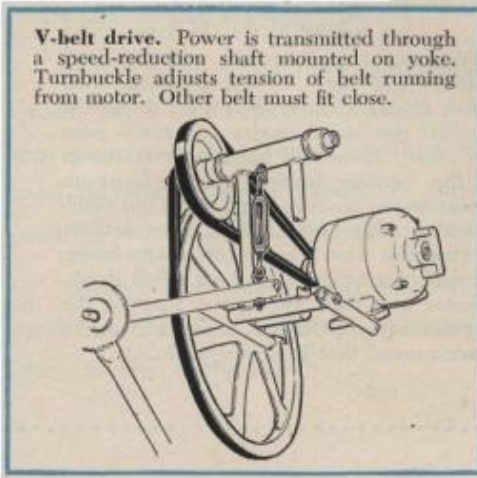


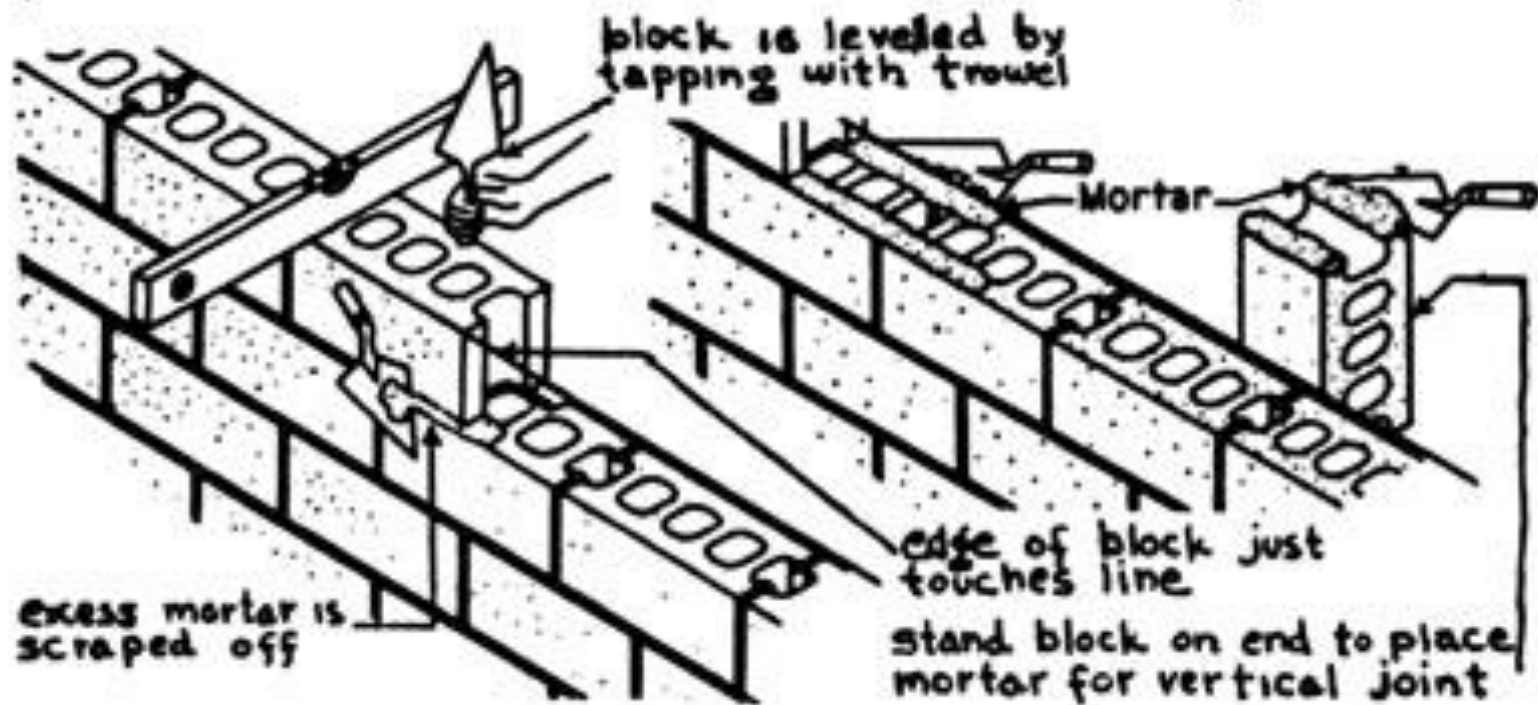
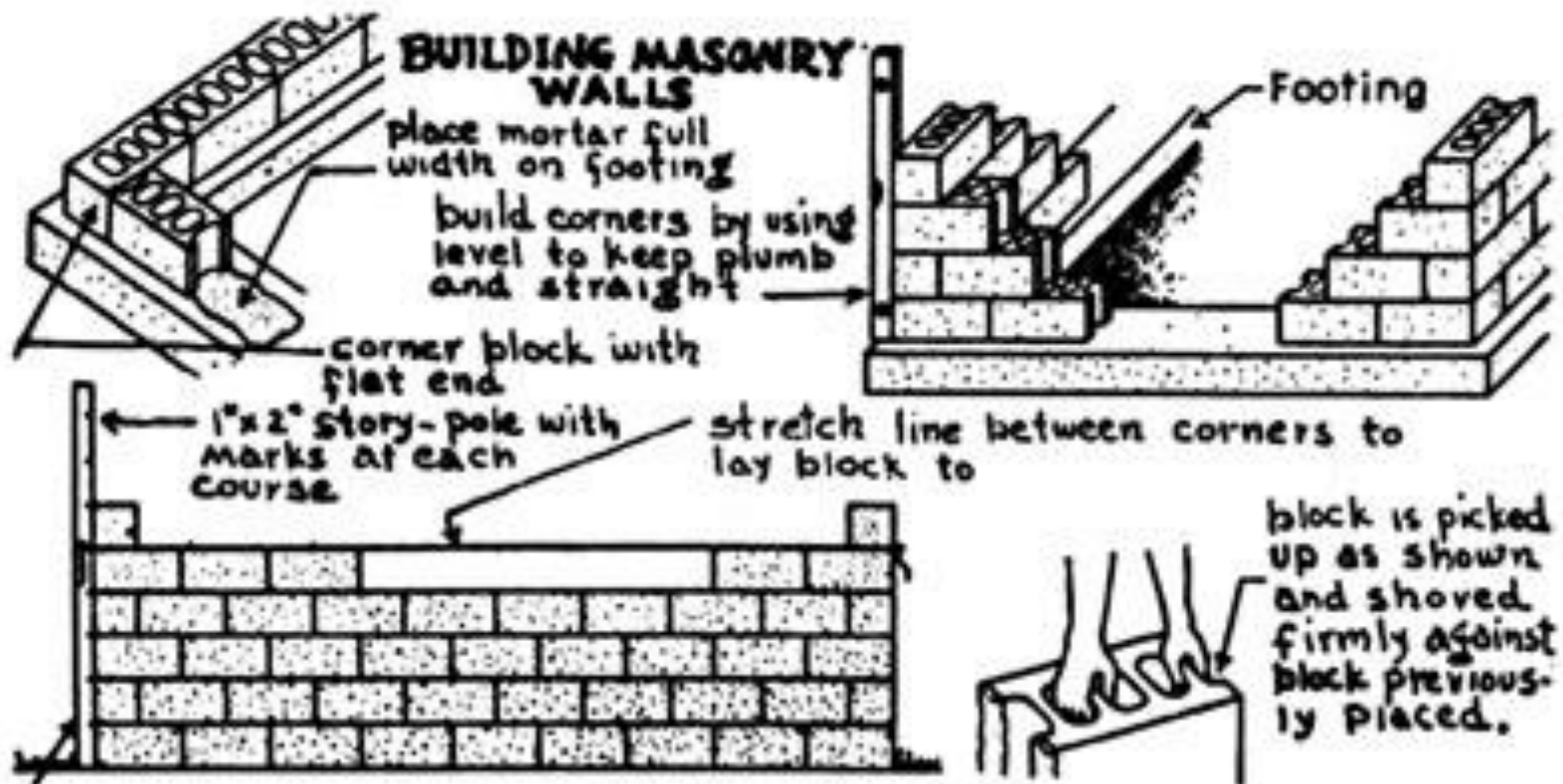
A black and white photograph of a man in a white shirt and cap operating a vintage mechanical device, possibly a pump or sprayer, outdoors. The device has a large flywheel and a handle. Two wooden buckets are in the foreground.

206 POPULAR SCIENCE

Construction. A light welder, electric drill and hacksaw are the tools you'll need. Materials can come from a plumber's scrap pile—3/8" and 1/2" pipe, and a few short pieces of 1/2" rod. The mixing blades are bent from 16-gauge sheet steel and bolted to the inside of the drum at a slight angle in the direc-

A technical line drawing of a mechanical pump assembly. It features a large flywheel on the left, connected to a crankshaft. A connecting rod links the crankshaft to a piston or plunger mechanism. The piston is positioned within a cylinder, which is part of a pump assembly. Various bolts, nuts, and structural supports are shown, indicating a complex mechanical design.





Woodworking

- Woodworking relies more on the strength of the joints than it does the hardware added to it; the stronger and more precise the joint, the better the piece
- Wood, just like metal and clay, has a grain that must be worked with instead of against; the grain gives the wood its strength and hardness, so when building with wood be sure the grain is carrying the weight like the tree carried its weight in the forest
- Wood can be carved, steam bent, turned on a lathe, and made into any shape imaginable
- If using for outdoor applications, a chemical wood sealer is necessary; when using wood for an agricultural project, use a non-toxic wood sealer or you will contaminate your food or livestock

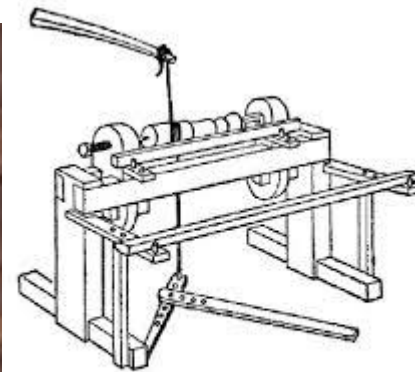
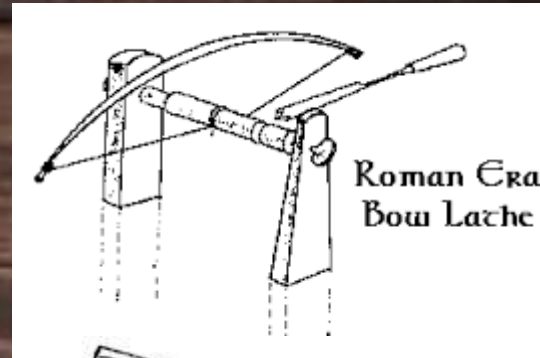
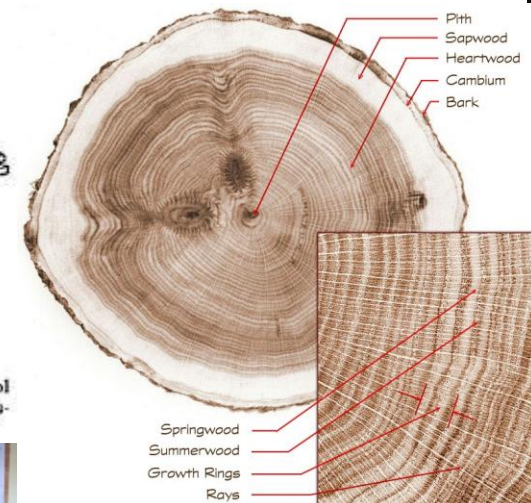


FIG. 63. Wood lathe with support for the tool (from Usher, A History of Mechanical Inventions, p. 362).



Sawmill

•Our Ward/Stake area has many older trees that eventually must come down – instead of paying for a service we could cut those trees into lumber

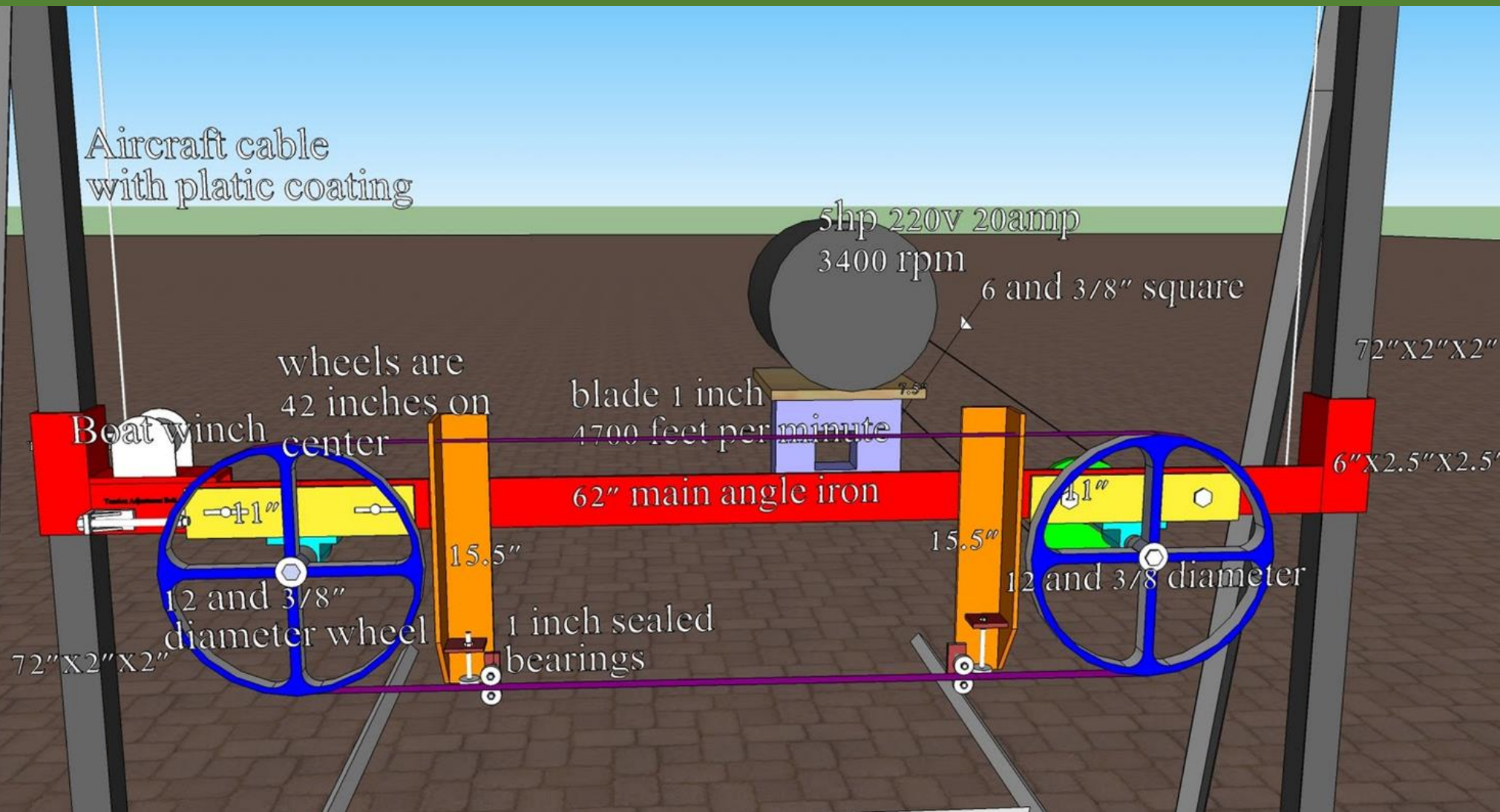
•Making planks and studs in ancient and medieval times required facing axes and wedges to split and dress the wood as saws were very expensive; these techniques survive today, but with mass produced saws and power tools it's currently a novelty

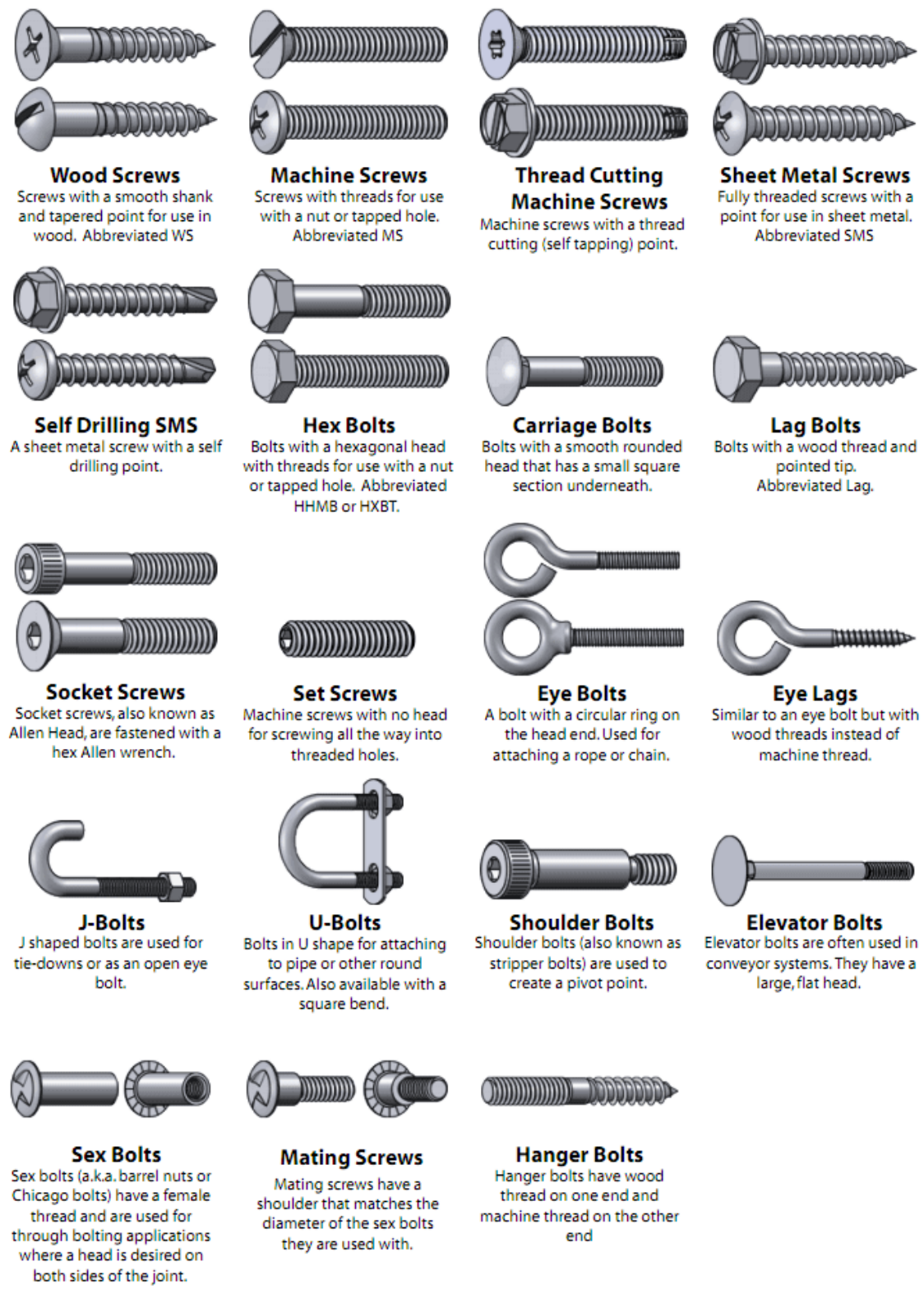
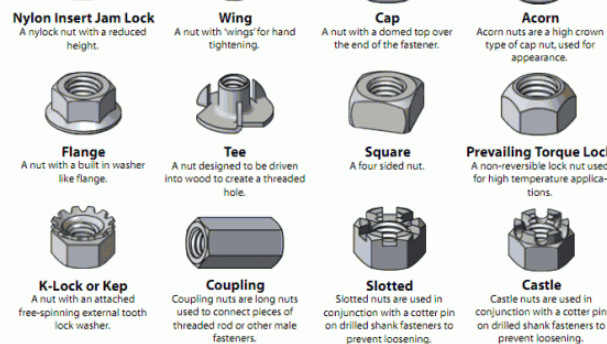
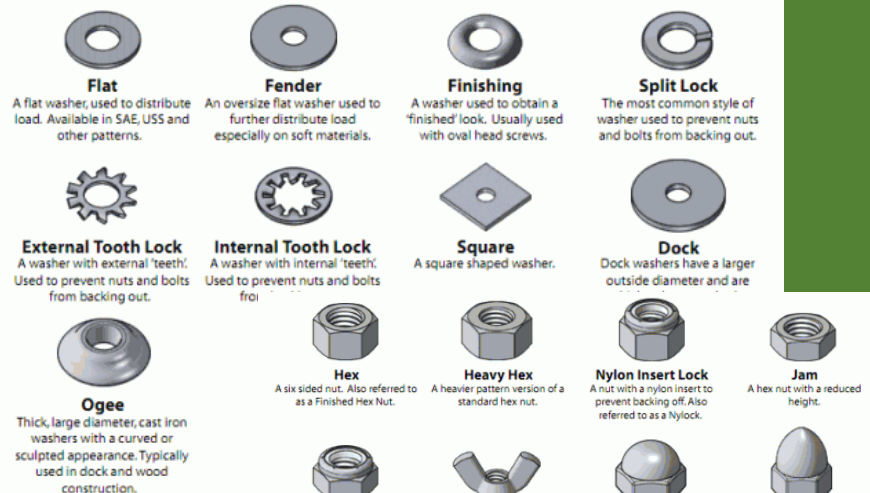
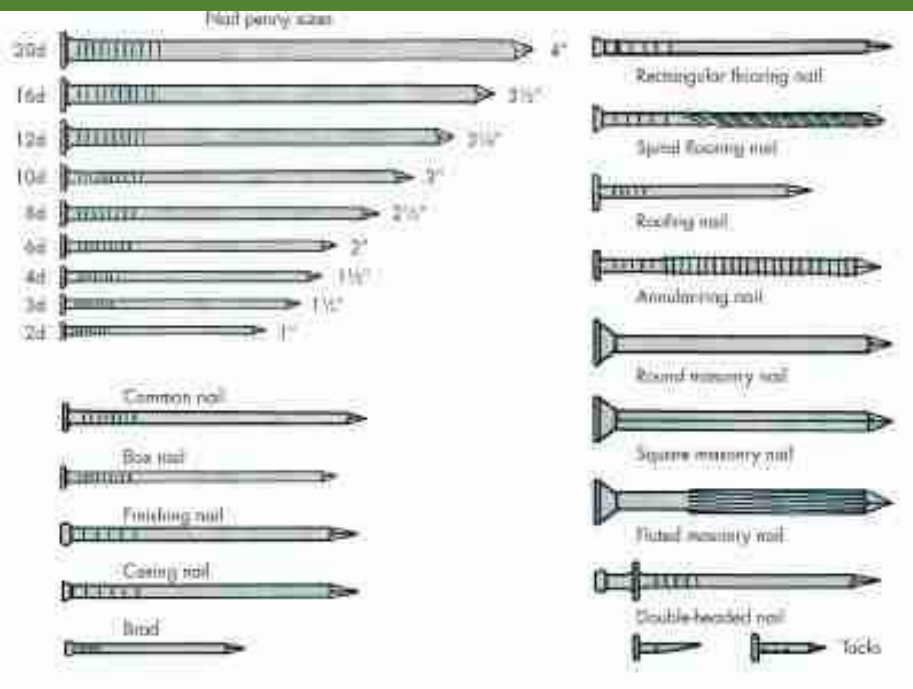
•To make lumber with a crosscut saw requires two people and an elevated platform with one person above to pull the saw, and another below to guide the saw and inhale the sawdust; using a chainsaw's sawmill attachment works much faster than a crosscut and requires one person, but the most efficient method is to use a large band-saw mill with a track

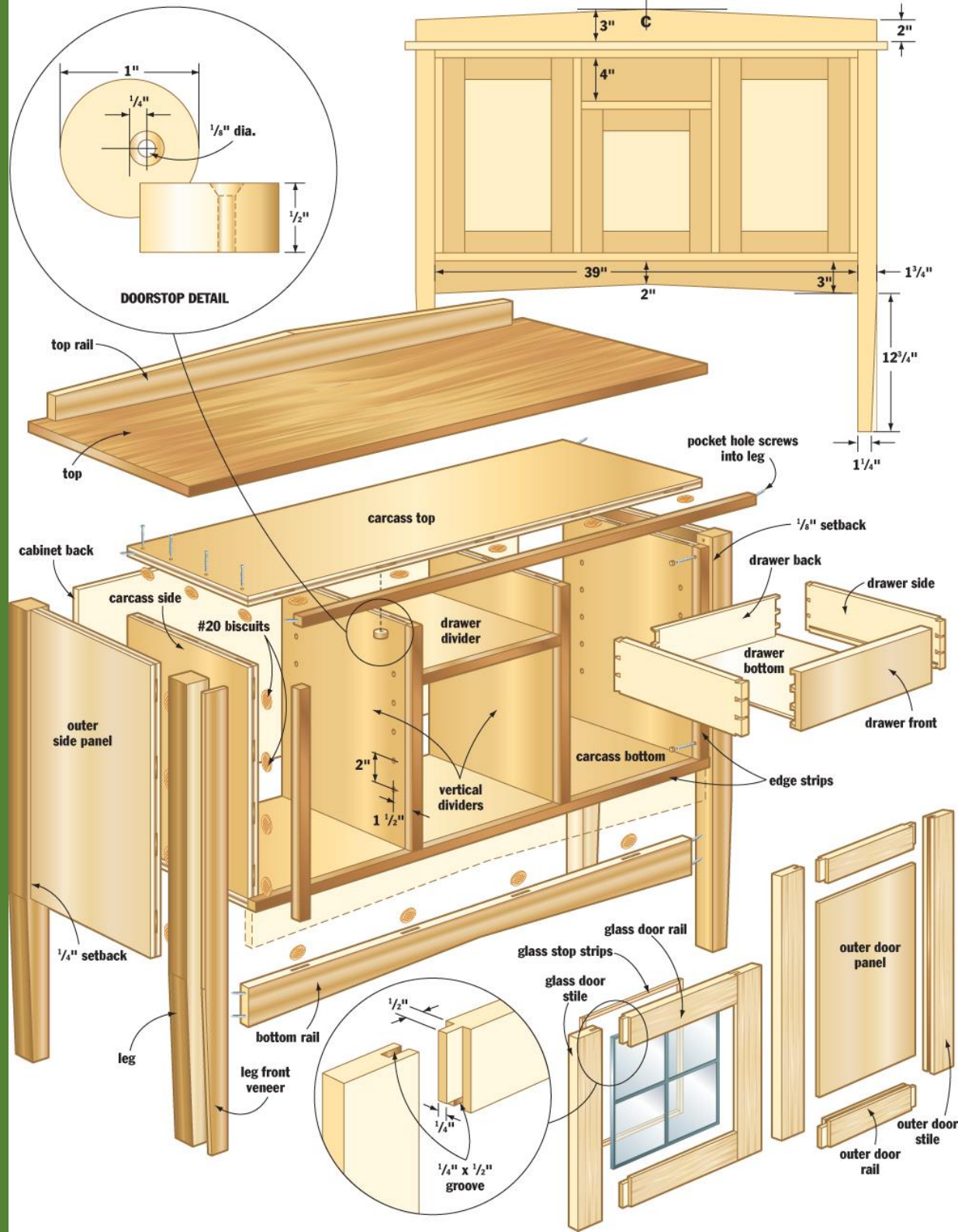
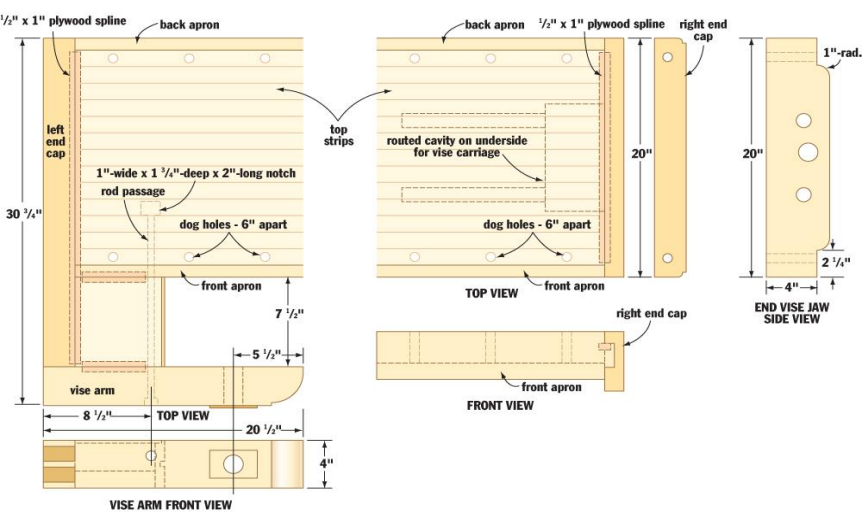
•Be sure to dry wood thoroughly and watch for signs of splitting and warping



Homemade Sawmill

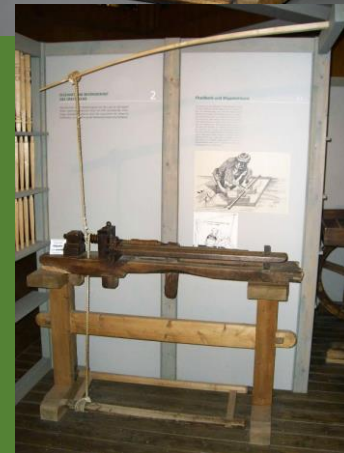






Wood Turning

- Since the bronze age craftsmen have turned wood on pole or treadle lathes; today we have all sort of powered and programmable lathes
- Turning requires a set of chisels and measuring tools to get consistent results; chisels for turning require larger than normal handles for stability and safety – replacing the handles on cheaper tools is fine
- Always wear proper protective equipment and no loose clothing: safety glasses and a face shield is a must
- The tool with motor driven lathes is rested on the tool bar and does not need removing until the craftsman is done; when turning on a pole lathe the piece rotates both ways, so the tool can only be used against the piece during the downward stroke and must be pulled back on the upward stroke
- Metal machining lathes, mills, and CNC's also work with wood



SHOP-MADE TURNING TOOLS

Over the years, I've found that some of my best turning tools are made from things I have lying around the shop. Pictured here are several tools made from allen wrenches, nails and screwdrivers. They are easy to make and quite effective in use.



Allen-wrench turning tool—(Second row, left in photo.) To make a bent tool from an Allen key, first turn a handle from medium-density wood. The handle should fit your hand—about 4 or 5 in. long is good. Drill a hole in the handle the same diameter as the cross section of the allen wrench. Then tap the wrench into the hole, so the shape of the hole conforms to the shaft of the wrench.

Next, remove the wrench, put in a few drops of “gap-filling” Super Glue, spray the shaft with Hot Shot

accelerator and jam the shaft back into the hole. (Super Glue and Hot Shot accelerator are available from Craft Supplies USA, 801-373-0917.) Grind the tip to the shape of a simple round-nose scraper, relieving the bottom edge 5° or so from the top edge. The tip should extend no more than $\frac{5}{8}$ in. from the bend. With the $\frac{3}{16}$ -in.-dia. wrench shown here, I extend the end no more than $2\frac{1}{2}$ in. from the handle.

Screwdriver turning tools—(Bottom four tools in photo.) Making bent and straight tools from standard screwdrivers is also simple. Start by grinding the tips to the shape of a round-nose scraper, as with the allen-wrench tool. At this point the straight tool is complete. For bent tools, place the shaft in a vise and heat the shaft with a propane hand torch until it's red. Then grab the tip with a wrench and bend it to 45°. The finished tip should extend no more than $\frac{1}{2}$ in. from the bend.

These little scrapers cut very well, even though they're not made from exotic steel. And they stay sharp for a surprisingly long time. To resharpen them, use a flat file instead of a grinder. This removes less material and helps preserve tip life. If you want to harden a tip, heat the metal to cherry-red and plunge the tip into motor oil.

Cement-nail tool—(Second row, right.) This tiny scraper is made from a hardened cement nail that's glued into a wood handle with Super Glue. The curved tip is not bent but shaped from the shaft of the nail with a chain saw file. Sounds primitive, but it works wonders.

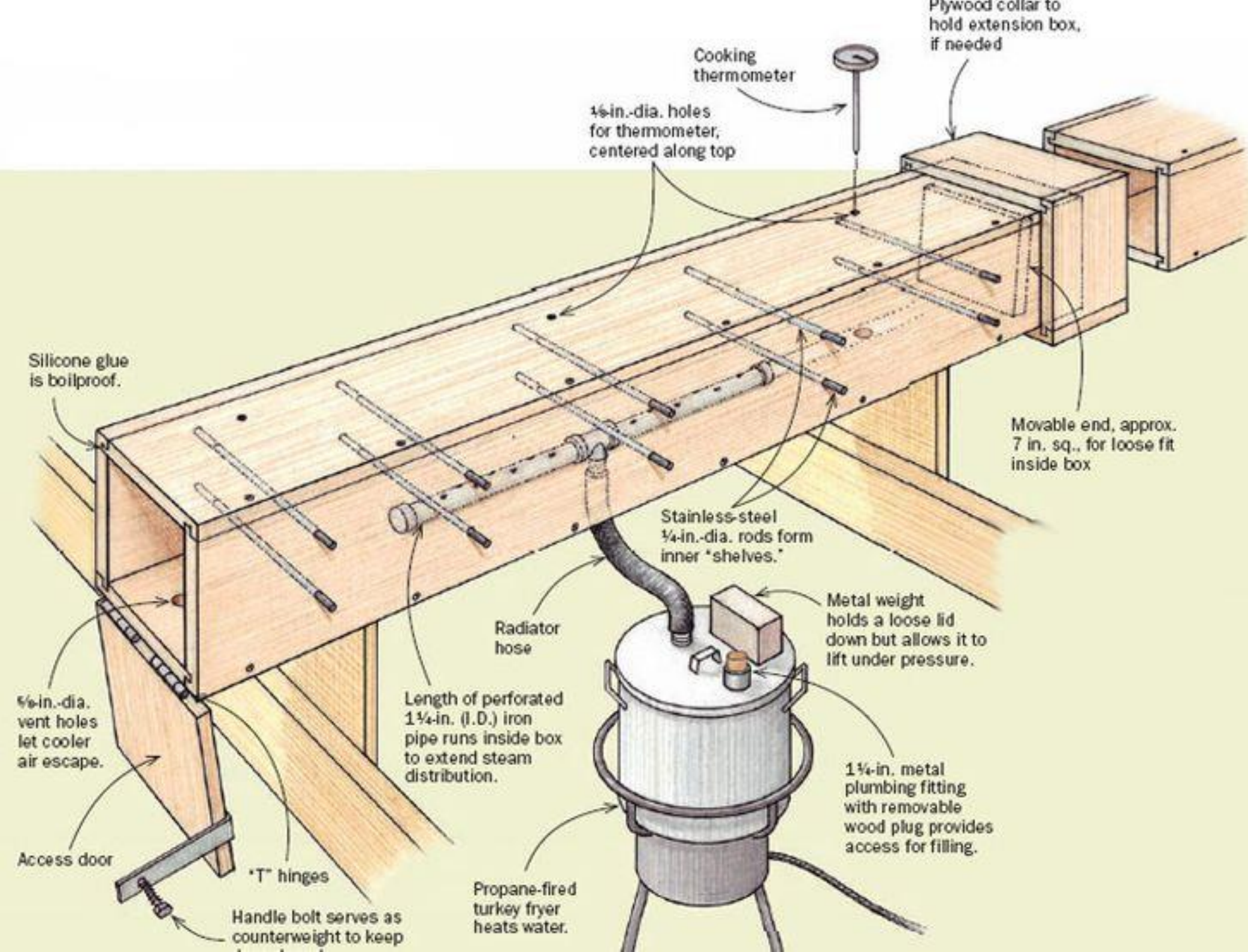
Modified parting tool—(Top row.) While this doesn't strictly qualify as a tool made from scrap metal, it is a handy shop-made tool. I make this parting tool, which I call a “barracuda,” by grinding away one side of a $\frac{3}{16}$ -in.-thick by $\frac{3}{8}$ -in.-wide round-nose scraper. I sharpen the concave bevel upside down on the grinding wheel, so the tip is at least $\frac{1}{16}$ in. below the center line of the tool. On dense materials, the edge of this curve will produce a very clean, shearing cut.—D.E.



Steam Bending

- Wood from the sawmill is only straight planks; however, certain types of furniture and applications require the wood to be in odd shapes; since cutting the wood to match these shapes weakens the grain, bending the wood is optimal
- To steam bend, start with a length of black drainage piping with caps at both ends; insert a gasket and threaded nipple to the center of the pipe for the steam hose; a heated container of boiling water that sends all the steam into the middle of the pipe is all that's needed; drill a hole at both ends to draw the steam to out
- The rule of thumb is one hour per inch of wood thickness; a 1X2 = 2 hours of steam, while a 4X4 = 16 hours
- Have a mold ready to go as the wood will not remain pliable for long; allow to naturally cool and thoroughly dry on the mold



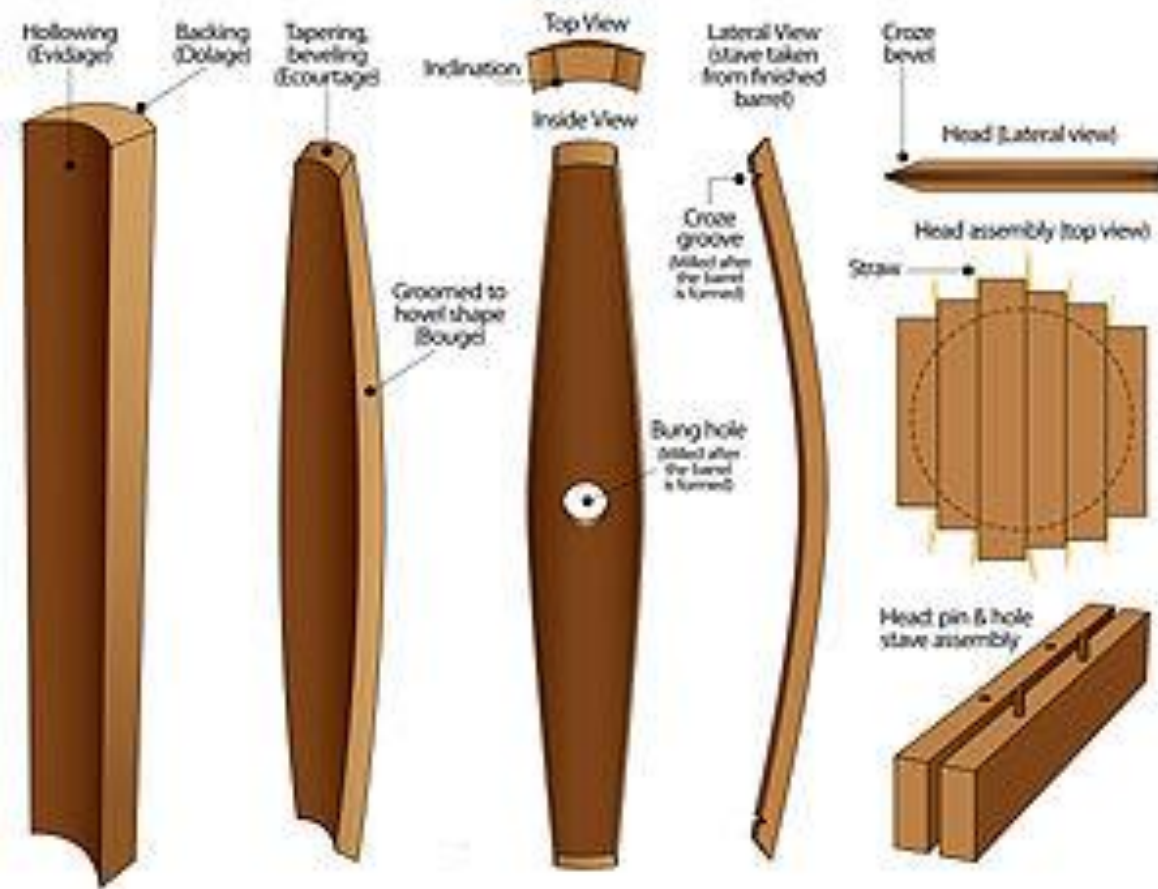


Coopering

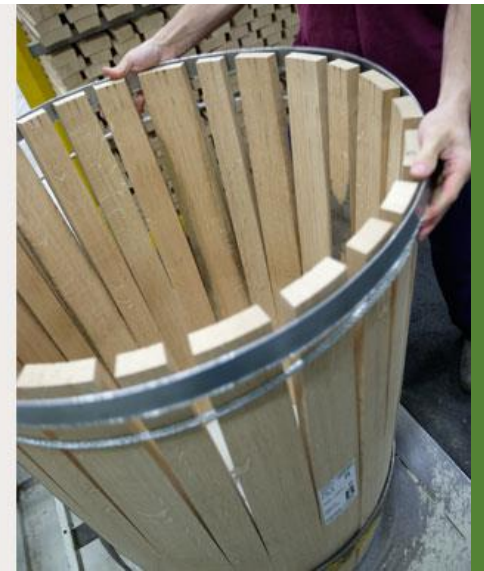
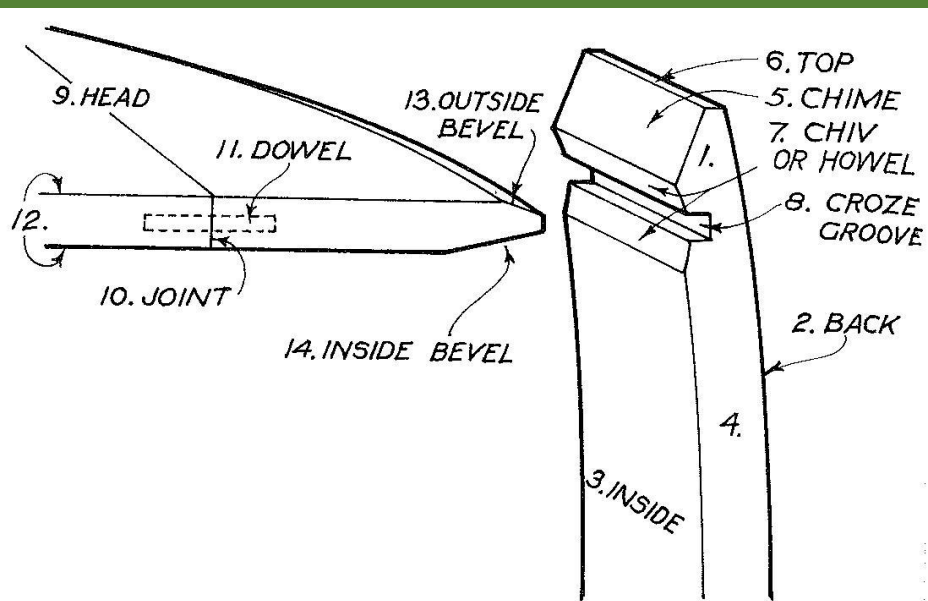
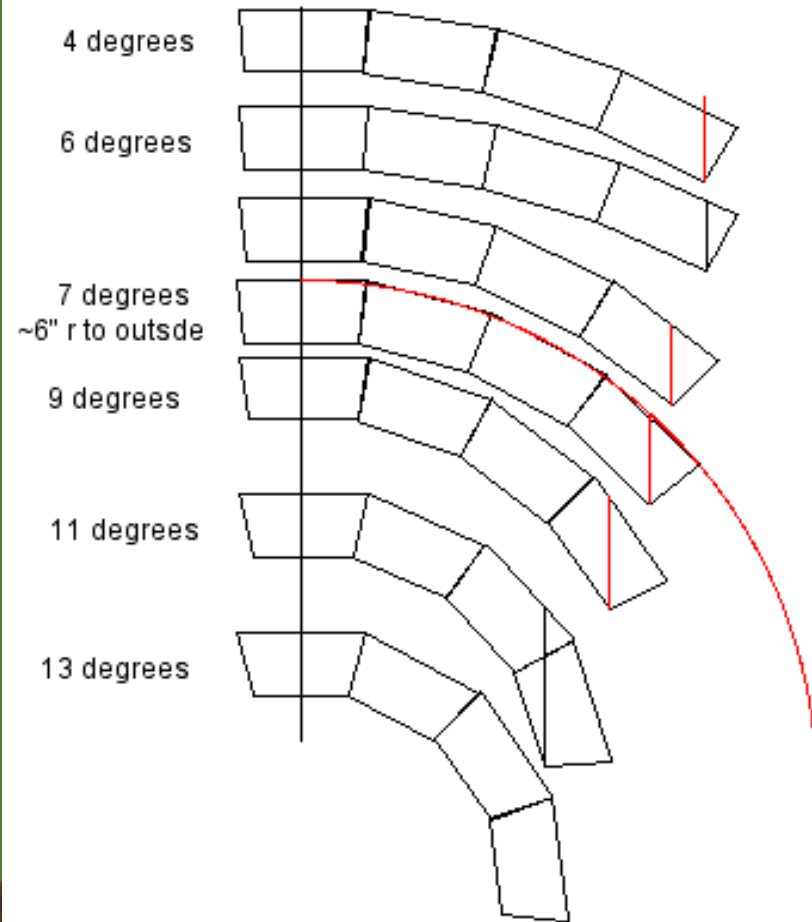
- Considered a lost art by some, still used by the alcohol industry for aging and flavoring, coopering (or barrel making) is not a regular staple of daily living anymore, but is a good test of a woodworkers abilities
- Coopering requires experience in joints, steam bending, carving, and some mathematics to result in functioning barrels, buckets, & bathtubs
- The mathematics involved rely heavily on geometry and trigonometry; the entire circular piece must result in 360° , so each stave should be measured at specific widths, lengths, and angles to achieve the circle
- Start with figuring out the math, then cut and carve your staves; steam the staves or soak in simmering water until pliable, then quickly arrange around the first hoops of the barrel; use a belt-jack to bend the top staves and place the top hoops; use a coopers plane to make the cuts for the lids on both ends; place the last hoops and remove the jack; to open and shut the barrels, use a chisel to pop off the end hoops to remove the lid



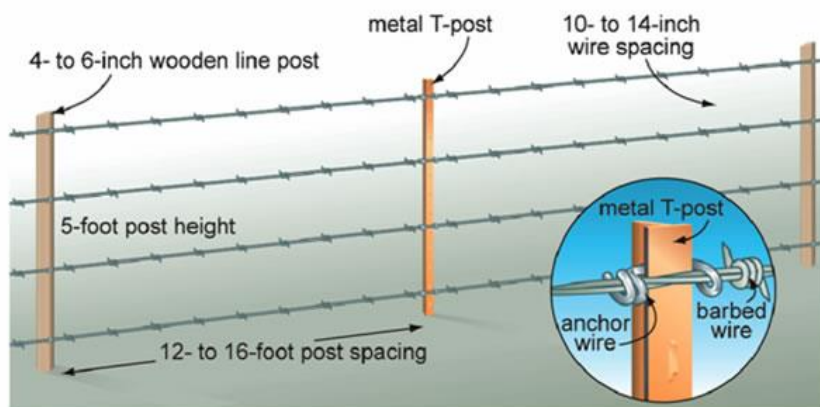
Cooperage. Shaping staves for a wine barrel.



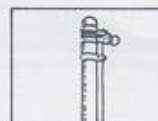
Staves - Playing With Angles



Fencing



15. Install rail ends. Tap post cap on post top.



16. Example of post with fittings installed.



17. Install top rail. Pipe runs through the loop of the eye-top.



18. Top rail sections are merely joined making a continuous railing.



19. At an end or corner post, mark rail so that it nestles into the cup of the rail end. Measuring carefully is essential.



20. Cut precisely on the mark made on the top rail.



21. Insert the end of the top rail into the cup of the rail end fitting and easily pop it into place by pushing down.



22. Tighten the end rail band until it is firmly locked into position.



23. Stretch bottom brace wire between main posts, wrap around main posts and twist tie, hog ring along fabric at 24\"/>



25. Chain link fabric is easily taken apart and spliced back together. To take apart or join open the "knuckle" at each end and twist out one of the pickets.



26. One single picket strand can be weaved in to join two sections of fabric - or excess material can be taken out by the same easy process.



27. Practice on a piece of chain link. Open the knuckle and twist the wire picket in or out.



28. Slip the tension bar through the end of the chain link fabric.



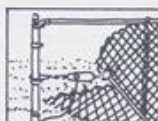
29. Slide the tension bar into the post tension band. Tighten the bands.



30. Attach fabric to the top rail with tie wires. It should be hung loosely. The fabric should be installed securely at one end - and draped loosely along the rail.



31. Slide a second tension bar approximately 10' from the end or corner post at the end of the fence line.



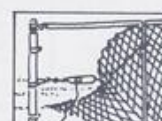
32. Attach the chain link "fence stretcher" to the tension bar and slowly pull the slack out of the fabric.



33. If you find there is too much slack in the fabric then reposition the tension bar and repeat the procedure.



34. To make sure that the fabric is well pulled out, grab it at different sections of the fence line and shake it. The diamonds should all line up.



35. Return to the stretcher and pull it again until you are sure that you have a nice, tightly drawn line of fence fabric.



36. You will now apply the tension bands just like you did at the opposite end of the fence line. The fabric should now be tight, but with a slight bit of floppy.



37. The floppiness of the chain link fabric will be corrected by the installation of the tie wires.



38. Line up the chain link fabric and twist the tie wires into place along the top rail and to all the posts along the fence line.

SECTION FOUR- STEPS 39 TO 40

Hang the Gates

After the entire fence has been completed, you are now ready to hang the Gates.

Remember, to prevent the gate from being lifted off, top Hinge Pins should be installed pointing down, Bottom Hinge Pins should be pointing up. Hang Gates so top so Gate will be level with top rail.



39. Mount the hinges so the top one points down - bottom one up. Don't tighten the hinges until you hang the gates.

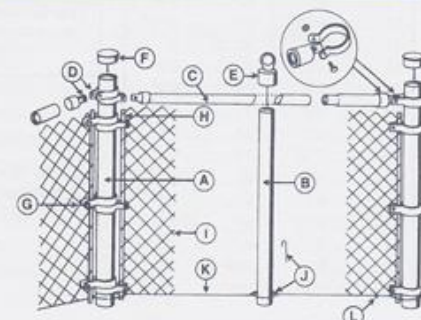


40. Hang gate. Make sure it swings properly and is lined up correctly. When you are sure, then tighten the hinges.

Fence Component Chart

- A) **Main Posts** - End, Gate, Corner
 - 1 1/8" O.D. Tube or Pipe
 - 2 3/8" O.D. Pipe.
- B) **Line Posts** - 1 1/2" O.D. Tube
 - 1 1/8" O.D. Pipe.
- C) **Top Rail** - 1 1/4" O.D. Tube
 - 1 1/8" O.D. Pipe.
- D) **Rail Ends & Brace Bands** - one set required for each top rail termination.
- E) **Line Post Caps** - one required for each line post.
- F) **Main Post Caps** - one required for each post.
- G) **Tension Bands** - Minimum of three required for each fabric termination.

- H) **Tension Bars** - One required for each fabric termination.
- I) **Chain Link Fabric** - 36", 42", 48", 60", 72" either galvanized or vinyl coated.
- J) **Tie Wires** - One required for every 24" of top rail - One required for every 12" of line posts.
- K) **Bottom Brace Wire** - to match fabric, same length as fence fabric plus ten percent.
- L) **Hog Rings** - One required for every 24" of bottom brace wire.



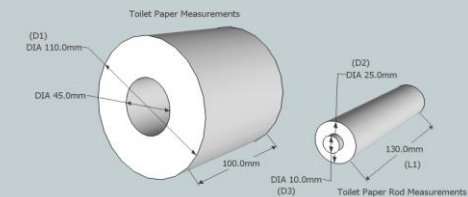
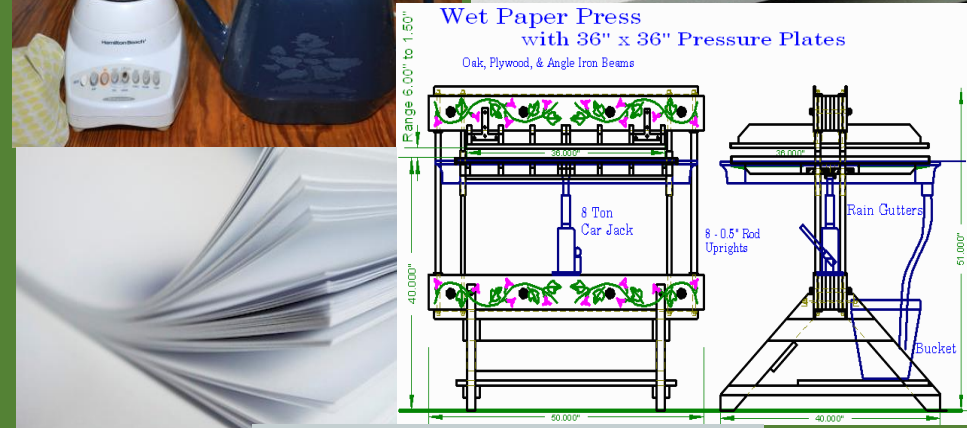
Paper Making

• Paper is made from any plant with fine fibers; longer the fibers, greater the need for further processing

• Most leftover garden plants can be utilized - along with used shredded paper, wood shavings, and tattered cloth; if using wood pieces and sawdust add a mix of sodium sulfide and lye to hot water for 1 ½ hours - this breaks up the cellulose and extracts the lignin (not a necessary step, but makes nicer product)

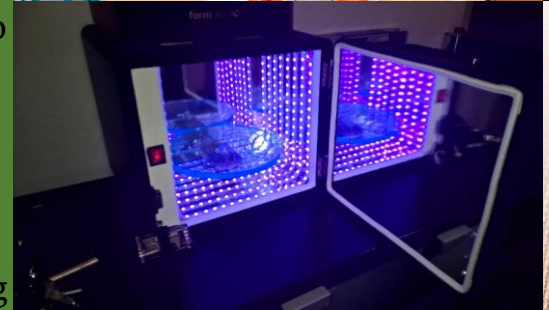
• Using a chopping machine or by hand, turn the fibrous material into pulp, strain through a screen, press out the excess water and hang up to dry; cut to size when dry (leaving in the sun will bleach the paper white)

• To make toilet paper; process same as normal paper, but bleach the pulp with hydrogen peroxide solution (5% or more), rinse, and then in a chemical softener (1% glycerin, 2% mineral oil, 97% water) – do not rinse; press the sheets thinner if possible



Sanitary Napkins, Incontinence Pads, and Baby Diapers

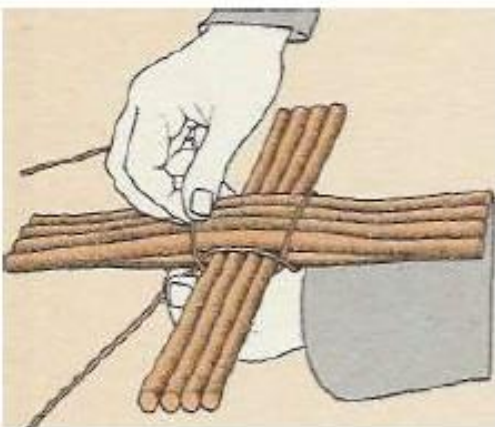
- A taboo subject but a very necessary product for multiple applications
- Going to need some specialty equipment, but all can be homemade: a press mold for the inside absorption layer with space for 3 or more pads, both solid and perforated thin plastic sheet (will need to order these in), a plastic sealer, a small slide to help get pulp into lining, some double sided light adhesive tape, some plastic bags, and a UV autoclave for sanitizing
- Use the same toilet paper making pulp prior to sieving – instead of sieving, place in a centrifuge to dry and fluff; store when ready
- To make: measure and seal the perforated plastic with the solid plastic to make a pocket with one wide end open; weigh .5-3 oz. of dry pulp (depending on need) and place evenly in the mold, when filled place the lid on top and press flat; move to the slide and gently let the pulp slide into the lining pocket – seal the open end; add the adhesive strip to the back of the solid plastic side; place in the UV autoclave for one hour; quickly seal into plastic bags and store when needed
- For incontinence pads or baby diapers: add water-absorbing silicate crystals to the dry pulp before pressing; use up to 10 oz. of pulp; double or triple the size of the pads



Basket Making

Making a hard basket

You need three different types of rod: eight short stout rods for the "slath", or base; a number of strong but bendy rods for your side stakes; and some weavers, the long thin whippy rods which hold the basket together. Side stakes are generally about eight inches (20 cm) longer than the intended height of the basket. Weavers can be any length, but they should be at least long enough to go round the basket once. They come in varying thicknesses.



Soak all your rods for an hour before using them. Cut eight rods for your slath, and cut slits in four of them. Poke the other four through to form a cross. Take a weaver about four feet long and tie tightly round the cross three times and tuck the ends in.



Loop a weaver round one rod, and "pair" by weaving with both its ends. Pair until the base is the right size.



Cut the ends of the base rods.

Shove in 31 side stakes, one each side of every rod, with one gap.



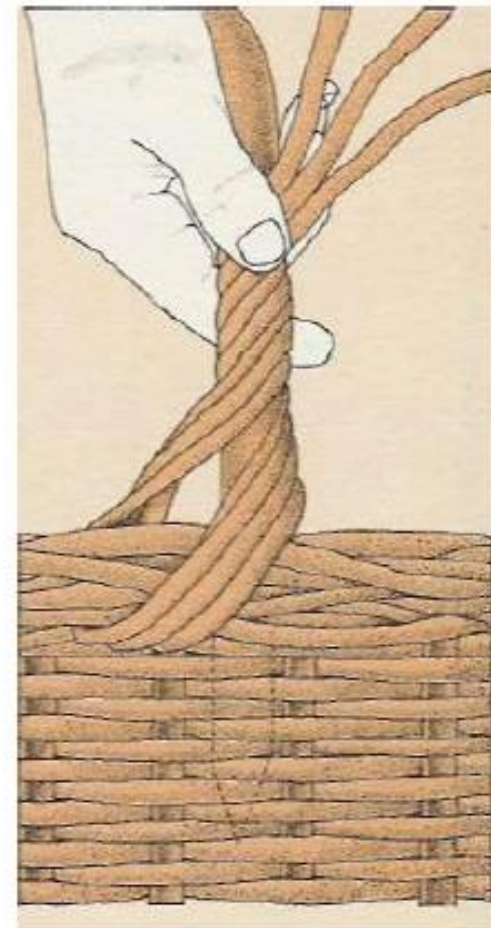
Start the sides with three rounds of "waling" (above). Take three weavers, hold them behind three adjacent stakes and weave round two stakes at a time.



"Rand" up the side of the basket (above). Use long weavers and weave in front and behind each stake. Begin and end weavers behind a stake.



Finish off with three rows of waling and then make a trac border (above) by bending the stakes over.



For the handle take a good thick base rod, sharpen both ends and poke them well down into the top waling on both sides of the basket. Take three thin weavers and loop them under the waling on one side. Plait them round the rod, and when you reach the other side poke the end well into the waling.

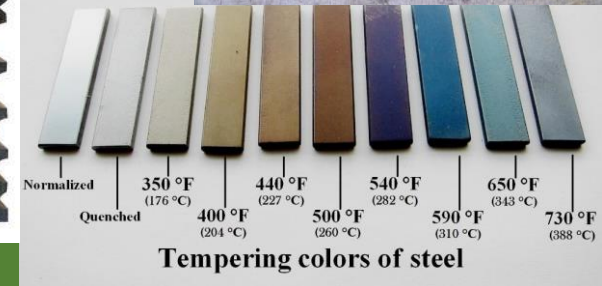
Metalworking

- One of the oldest skills, backyard metalworking is making a comeback – especially with melting aluminum and machining
- Blacksmithing and sheet metal working makes and repairs tools, welding for home and automotive repairs
- Initial investment for blacksmithing and foundry work is very low, but has a gradual learning curve; machining and welding are expensive and has a steep learning curve; might need classes to gain the right skill set

4	PROPERTIES OF METALS			
	STEEL	STAINLESS STEEL	ALUMINUM	COPPER
Ductility / Formability	Medium	High	Low	Very High (if annealed)
Weldability	Easy	Medium	Hard	Very Hard
Machinability	Medium	Hard	Easy	Very Hard
Tensile Strength	Medium	High	Low	Very Low
Weight	Medium	Heavy	Light	Medium
Cost	~\$0.50/lb	~\$2.00/lb	~\$2.50/lb	~\$9.50/lb

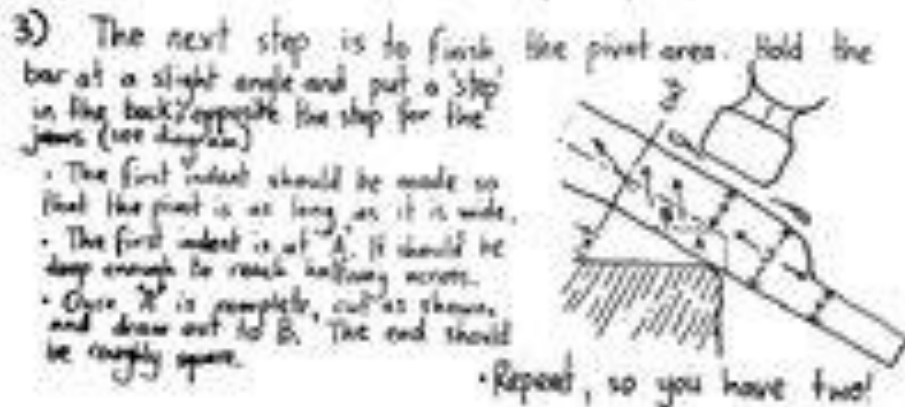
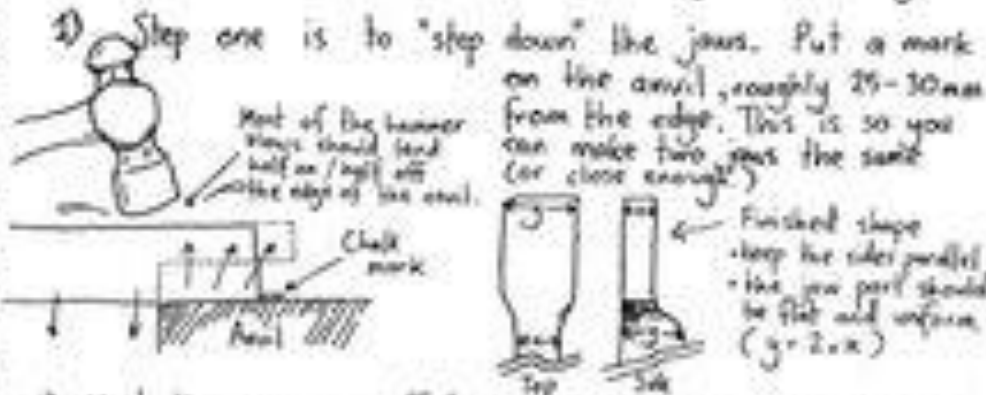
Blacksmithing

- Tools and hardware will eventually wear out; blacksmithing is an easy way to make new or repair
- A cheap set-up includes a forge (thick metal container with some plumbing parts and a hair dryer), a striking surface, and a bucket of water; requires few tools: hammers, grips (tongs), hot chisel, cold chisel, files, and a bench vice; thick metal surface or scrap railroad track make fine anvils; most apprentices learned the craft by making their own tools
- Heat iron-based metals to bright red and pound quickly; return to the fire when glow turns to a dark red
- For forge welding; clean metal with a wire brush and use sand as flux; heat to very bright yellow and quickly pound pieces together on the anvil
- Use a swage block and inserts to create specific shapes
- Best to work with another person; the experienced smithy uses a smaller hammer to hit the hot metal, the assistant uses a sledge to hit the same spot; repeat the process; smaller hammer hits the anvil as a signal to stop
- Be sure to only smithy on green burn days; between 9 AM and 5 PM – be careful not to start a fire

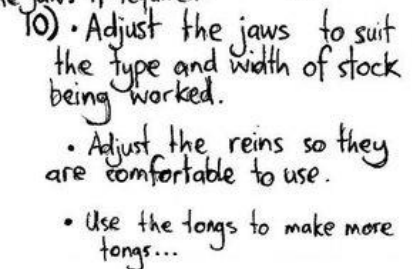
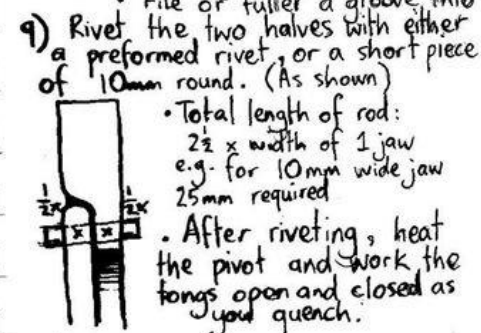
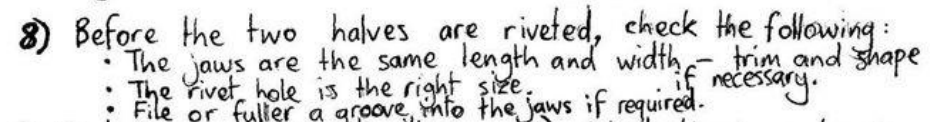
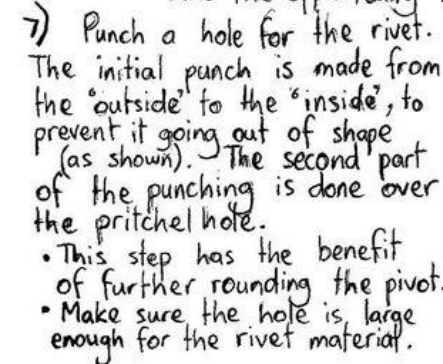


Tongs (part I) - Start with a piece of steel for the jaws, approx 25mm x 12mm x 400mm and two pieces about 500mm of 12mm round for the reins.

- You will also need a small piece of 10mm for the rivet.
- These steps are for right-handed tongs.



Tongs (part II) • If you followed part I, you should have the jaws complete. Now it's time for the reins...



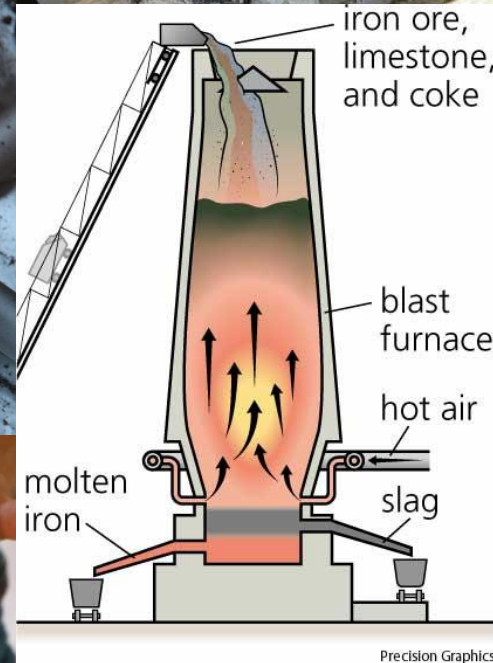
Metal Foundry

•A simple furnace: first insert a pipe at the base of a metal bin, and then insulate the bin with a mix of clay, sand, and sawdust; line the bottom, sides, and a lid with it all compacted thoroughly; use gas or charcoal as fuel – the pipe at the bottom is connected to a hair dryer, shop vac exhaust port, or industrial blower; could line with Kaowool instead

•A steel pipe crucible is good to use for noble metals (aluminum, tin, copper, silver, gold, etc.) and a graphite or silicate crucible for iron and steel

•To mold metal: use casting sand for your mold, placed in a frame; make a wooden die of the object to be cast and coat with smooth latex paint for easy removal; create a cone-shaped opening above the die and carefully separate the frames and remove the die; replace and pour in molten metal and remove when cooled – grind or machine to finish

•To make casting sand: mix equal parts play sand with pulverized, clean, unscented, untreated cat litter; lightly spray with water until the sand clumps in your clenched hand and holds the shape



Different Types of Furnaces

- Unlike noble metals, ferrous metal ore (iron, steel) are thoroughly mixed into mineral deposits and requires a different method of extraction; there are three major types of furnaces: blast, bloom, and crucible
- Blast furnaces take in raw coal, ore, and limestone (in that order) to extract molten iron (pig iron if carbon's too high); A blast furnace is built like regular furnaces, except taller with two small openings at the bottom for the molten iron and slag to exit; air is blasted inside to liquefy the metal; pour through the top in layers: coal, then iron ore, then crushed limestone – the remaining deposits come out as slag; ingots need forging quickly to make wrought iron
- Bloom furnaces work at a lower temperature than blast furnaces, using coal to weld scrap iron and pig iron into a single ingot (bloom); bloom furnaces are made with bricks and taken apart as soon as bloom is ready to come out; when removed it's worked quickly on the anvil into wrought iron and steel; run a file over the cooled bloom to find which parts are iron and which are steel (iron grabs the file while steel glides over it)
- Crucible steel requires (in this order): cast iron, wrought iron, and a carbon source (in ancient times, this could be the dried and crushed bones of apex predators or dead warriors to give “magical” properties to weapons) into a sealed crucible and superheated in a bloom furnace; the resulting ingot is highly valued steel



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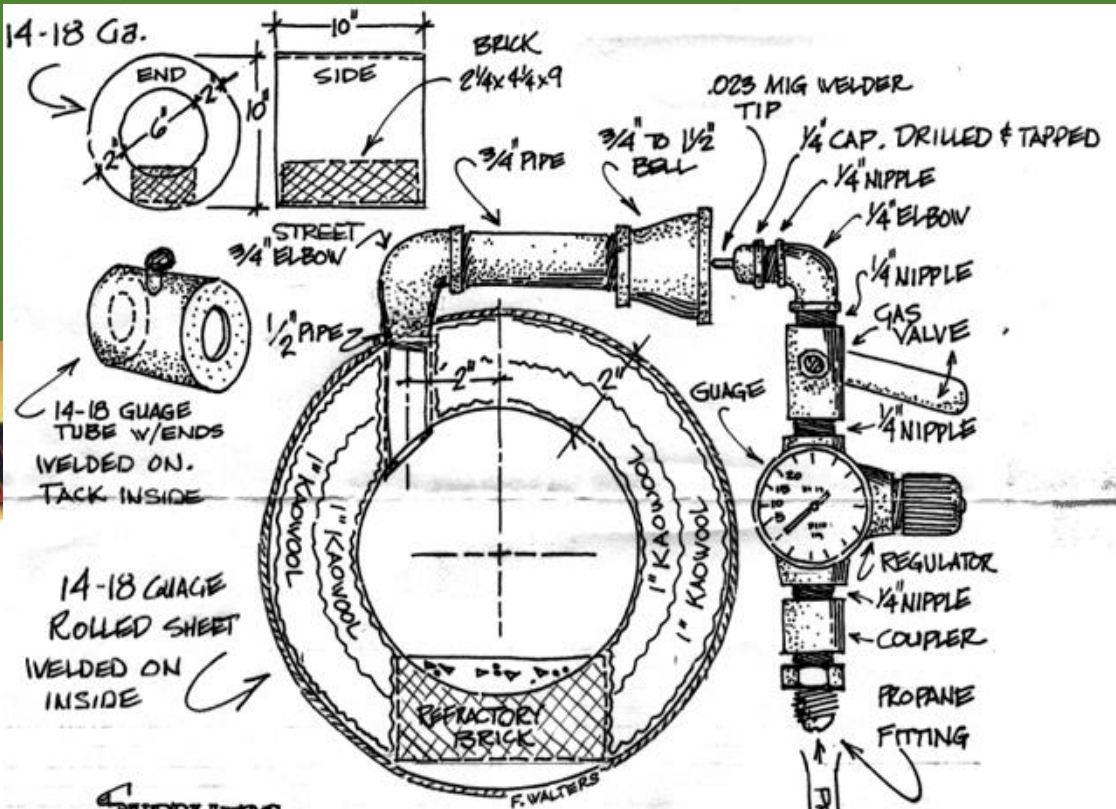


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14-18 G8.



SUPPLIERS

- 0 REFRACTORY BRICK - A.P. GREEN-8921 RAILWOOD
G10 & MC CARTY 201-434-0620
MINIMUM 25 BRICK CARTON (GREEN LITE 26) \$90.00 + TAX
- 0 KAOWOOL - ABLE REFRACTORY PRODUCTS-5220 TEXAS
HARRISBURG & LOCKWOOD 713-926-9623
MINIMUM 1" x 50 SQ FT \$80.00 + TAX
- 0 KAOWOOL STABILIZER - ABLE REFRACTORY PRODUCTS
MINIMUM 1 gal. SODIUM SILICATE (WATER GLASS) \$3.00 gal. WILL COVER 50 SQ FT.

- 0 ALL PIPE AND FITTINGS SHOULD BE BLACK PIPE.
- 0 TEFLON ALL JOINTS DURING ASSEMBLY
- 0 FORCE OPERATES BEST BETWEEN 5 PSI AND 15 PSI.
- 0 MIG TIP PLACEMENT @ BALL OPENING, AS DRAWN, IMPORTANT.

PROPANE FORGE

BASIC CONCEPT & LAYOUT

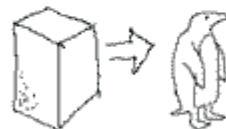
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8/21/2005

LOST FOAM CASTING

© 2005 HOLISTICFORGEWORKS.COM

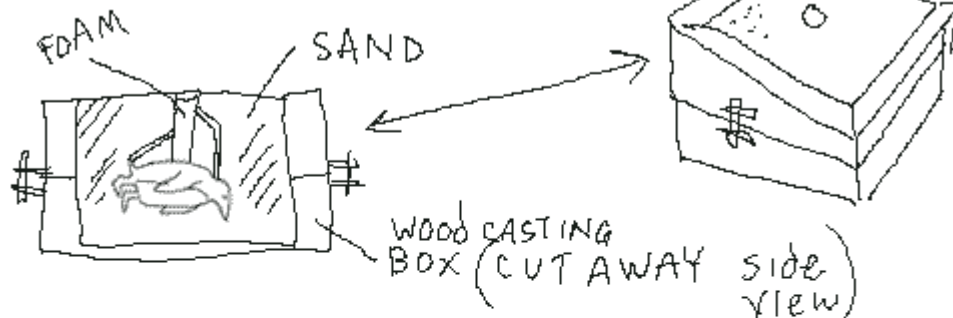
- ① CARVE YOUR MOLD OUT OF PINK INSULATION FOAM BOARD



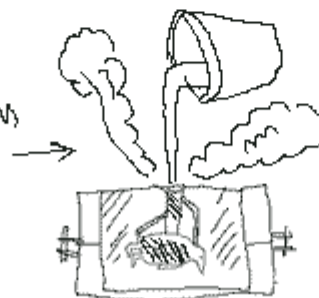
- ② ADD RUNNERS AND VENTING... (OUT OF FOAM & STRAWS)



- ③ PACK FOAM Model into SAND box



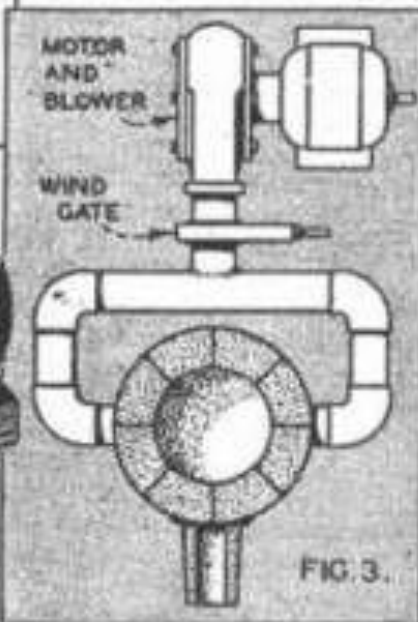
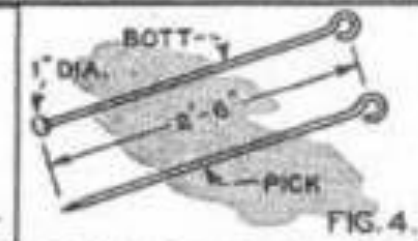
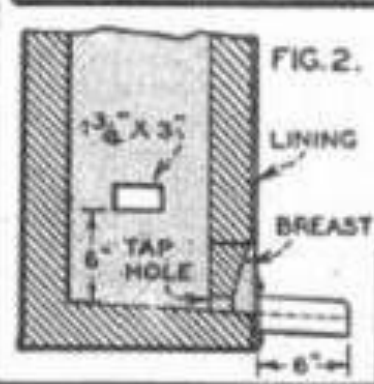
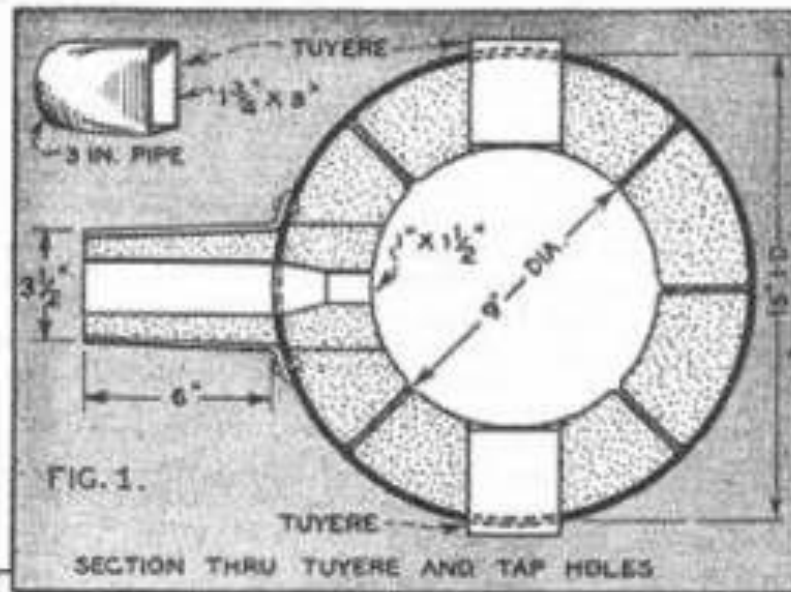
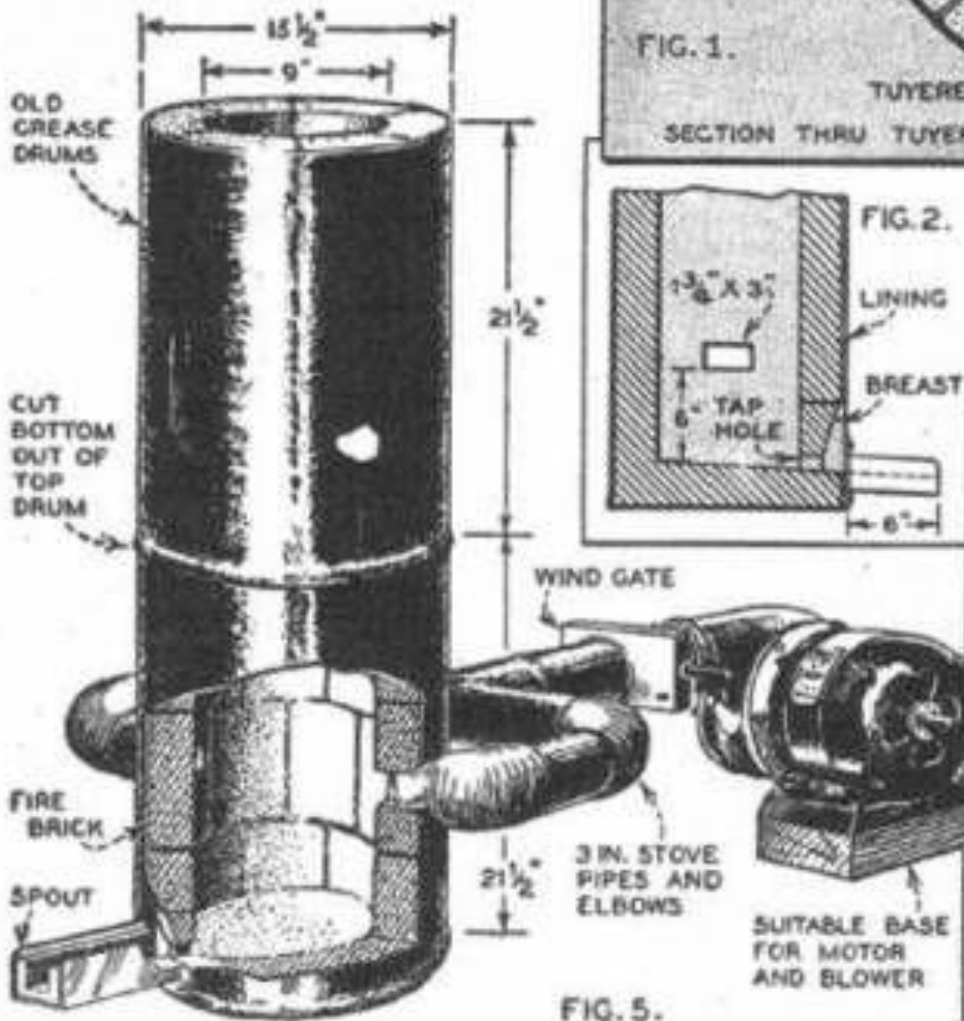
- ④ POUR METAL ON FOAM



THE FOAM CARVING VAPORIZES INSTANTLY LEAVING THE SAND MOLD!

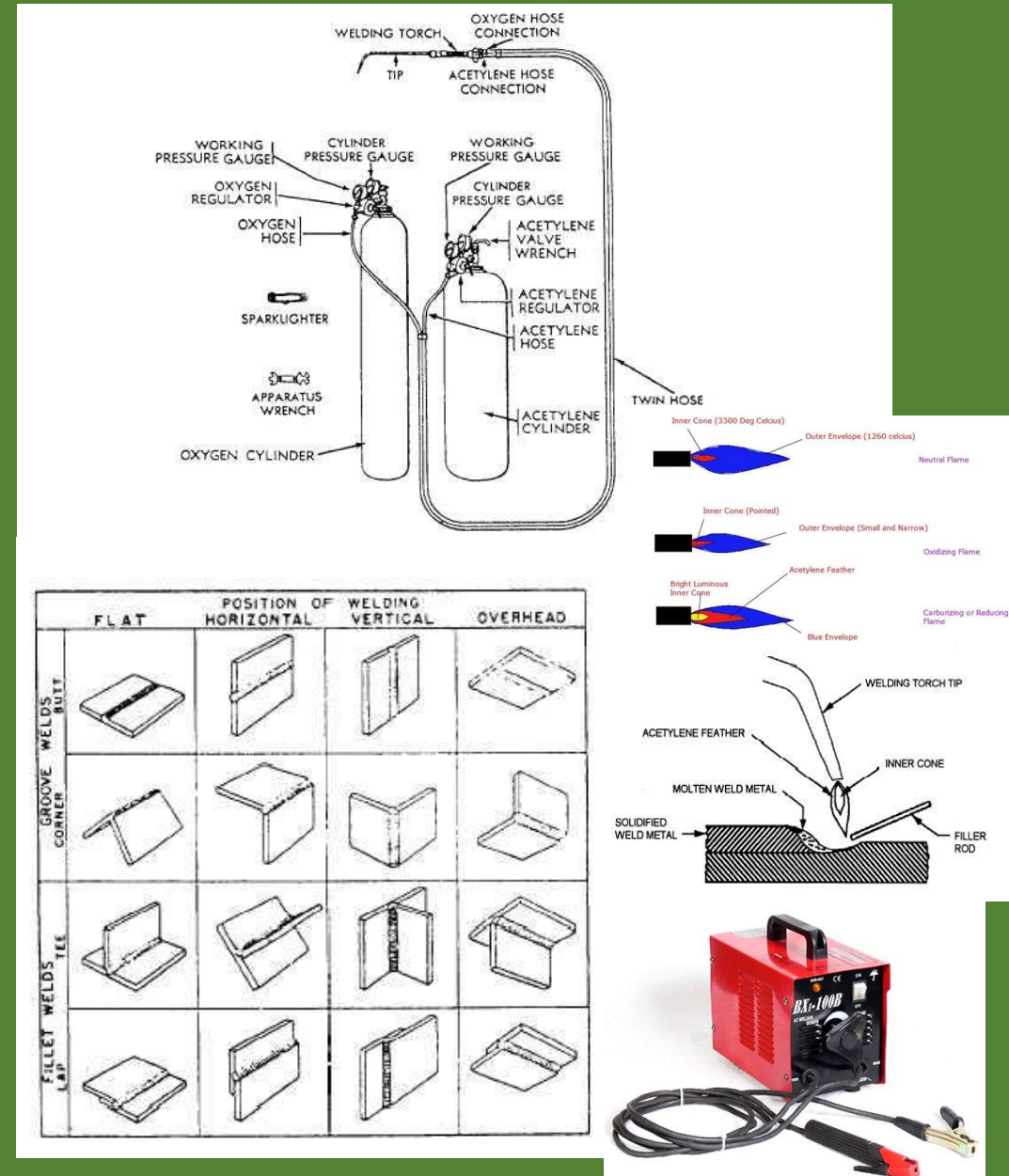
Workshop

Scrap iron can be quickly and safely melted in small quantities for castings, etc. with this home blast furnace.



Welding, Brazing, and Soldering

- Welding melts the workpieces and adds a filler material to form a pool of molten material that cools to become a strong joint
- Apart from forge welding, Arc welding and oxy-acetylene are the best methods for the home workshop
- Brazing is a joining process in which a filler metal that's the same metal as the workpiece is melted and drawn into a capillary formed by the assembly of two or more work pieces; not normally used for the home, but creates a strong bond
- Soldering is a joining process that occurs at temperatures below 450°C (842°F); it is similar to brazing in the fact that a filler is melted and drawn into a capillary to form a joint, although at a lower temperature – this is a very common joining method for the home



Metal Machining

- Machining metal involves cutting the metal to a precision of 0.001-0.0001 inch

- Lathes spin the piece against a tool that creates chips of waste metal: lathes only work on a horizontal plane (x,y axis) moving tool steel (HSS), carbide, and diamond tools specifically shaped to carve out the desired item; normally works within a 0.001 tolerance, but can go more precise if needed

- Mills clamp down the material and move it in 3 different directions to create chips (x,y,z axis): mills rotate the tool against the piece, the operator uses levers to move the piece; normally works within a 0.001 tolerance

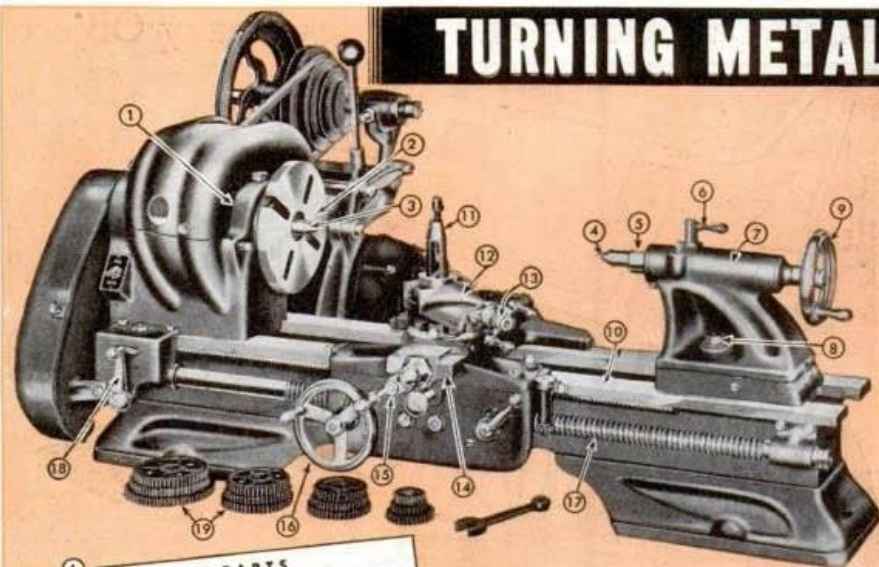
- Grinding removes chips by spinning a carborundum stone against the piece to a tolerance of 0.0001 standard

- Measure product with a micrometer, caliper, and machinist's ruler

- These machines are expensive, but can be made at home, but accuracy suffers



TURNING METAL



LATHE PARTS

- | | |
|---------------------------|------------------------|
| 1—Front bearing | 10—Ways |
| 2—Face plate | 11—Tool post |
| 3—Headstock (live) center | 12—Compound rest |
| 4—Tailstock (dead) center | 13—Compound feed screw |
| 5—Tail spindle | 14—Cross slide |
| 6—Tail-spindle lock | 15—Cross-feed screw |
| 7—Tailstock slide | 16—Hand feed |
| 8—Locking bolt | 17—Lead screw |
| 9—Tailstock hand wheel | 18—Change-gear handle |
| | 19—Compound gears |

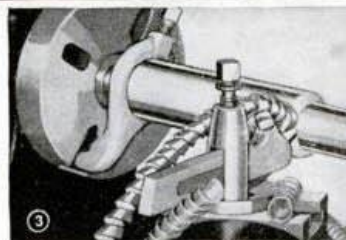
METAL-TURNING lathes are precision machine tools. The parts are machined to size within close tolerances as precision in lathe turning depends as much upon their accuracy and smooth operation as it does upon the worker's skill. Nomenclature of the most important parts, to which constant reference is made, is given in Fig. 1.

Lathe must be level and at correct height: The first thing to do to assure good work and efficient performance is to set up the lathe at a suitable height for ease of working. For the average person, standard work height is about 33 in. If you are tall, your lathe should be blocked up so that you need not stoop over the work. Then the lathe must be leveled carefully on a solid floor or bench, depending on whether it is a floor model or a bench type. If the lathe is not level it cannot turn out accurate work. Leveling is done as follows: Use an accurate carpenter's level or a precision-ground machinist's level and first place it crosswise on the ways close to the headstock, then crosswise at the extreme tailstock end, and longitudinally about midway on either front or rear way. Place thin shims of hardwood or metal under the legs as in Fig. 2 until the required level is attained. Then bolt the legs to the floor or bench, gradually tightening the nuts in sequence a little at a time until the lathe is anchored firmly.

Taking up headstock play: If you have purchased a used lathe, the headstock spindle must be checked for play. If it rotates

ACCURATELY

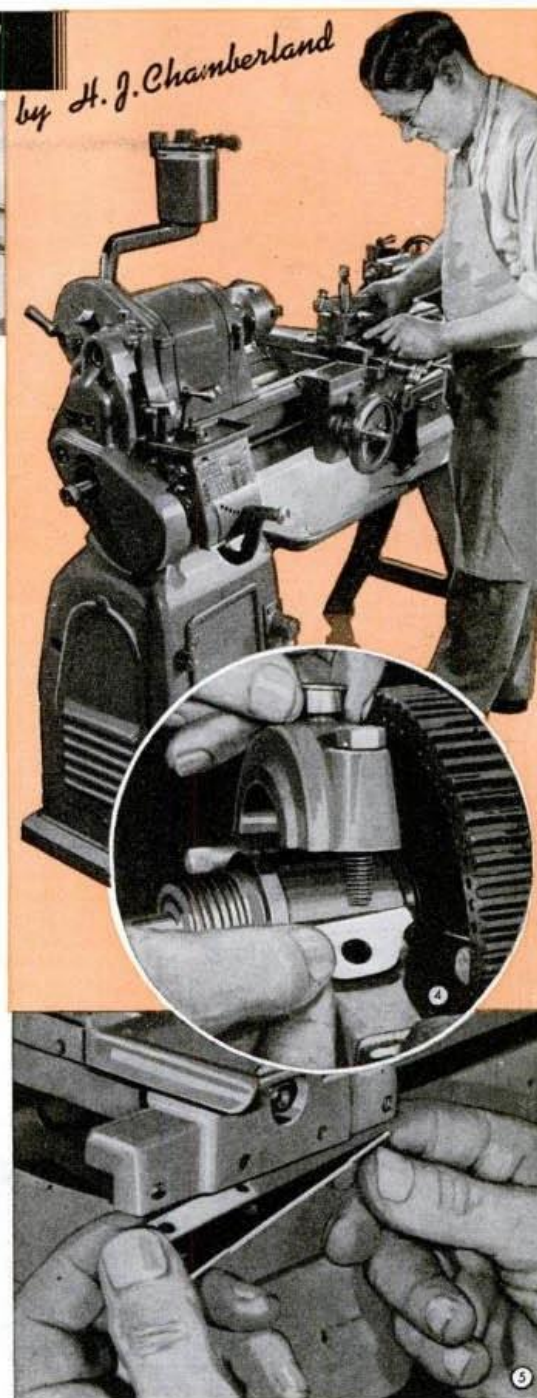
by H. J. Chamberland

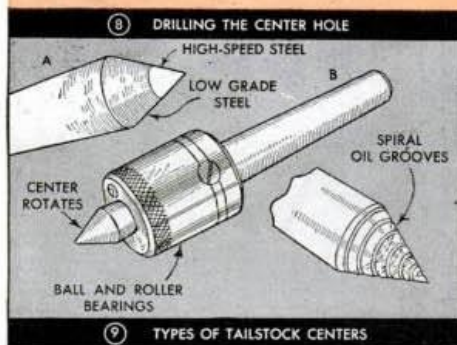
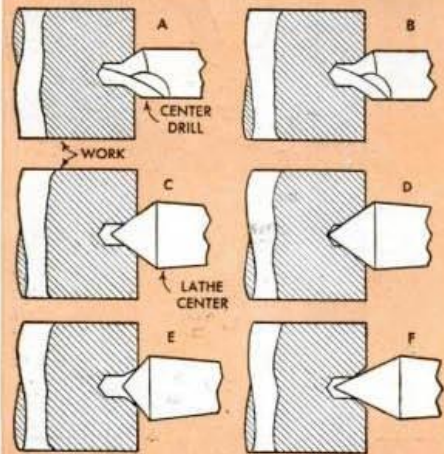
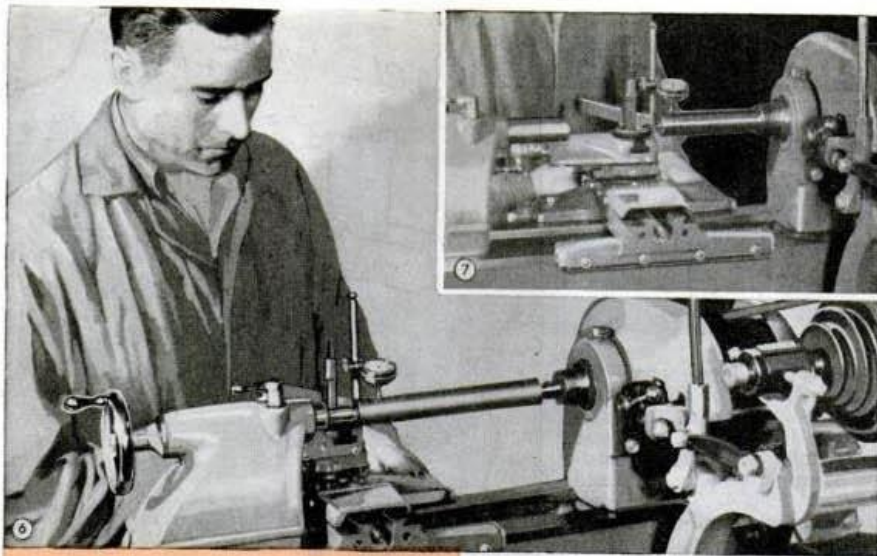


as freely as a bicycle wheel, the front bearing of the spindle is worn. In this case, the bearing cap is removed to expose two laminated shims, consisting of very thin sheets pressed together, Fig. 4. These sheets are removed equally from both shims until the spindle turns tightly when rotated by hand after the bearing cap has been tightened down. Then the bearing bolts are loosened slightly, the bearing lubricated with light machine oil and the lathe is run idle for ½ hr. at medium speed. When the bearing bolts have again been tightened, the spindle should now operate without heating. If not, it may be necessary to restore one of the shim sheets. With badly worn lathes, this procedure must be repeated with the rear bearing.

Carriage wear: There is likely to be wear also in the carriage. This has a removable front and rear bearing plate, each housing laminated shims, as shown in Fig. 5. These are used to prevent vertical play. Also, there are four small screws that press against a gib to take up horizontal play. Adjustments on the cross slide and compound rest are made similarly, but the two adjustments on each are made simultaneously because of the dovetailed construction of the slides.

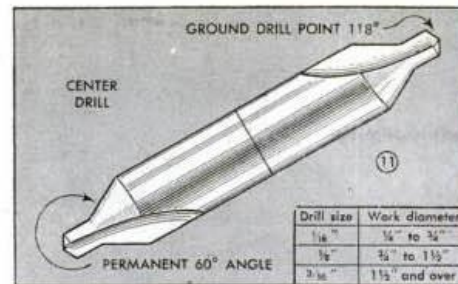
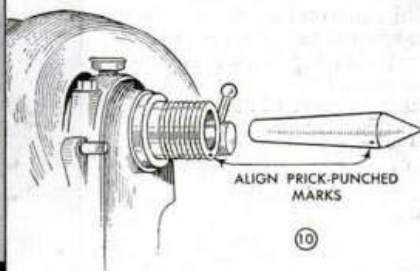
Lathe centers: Both centers of a lathe must be in perfect alignment. To check alignment of centers, a test bar is used as in Fig. 6. This can be a 12-in. length of round stock 1 in. in diameter, and must be concen-





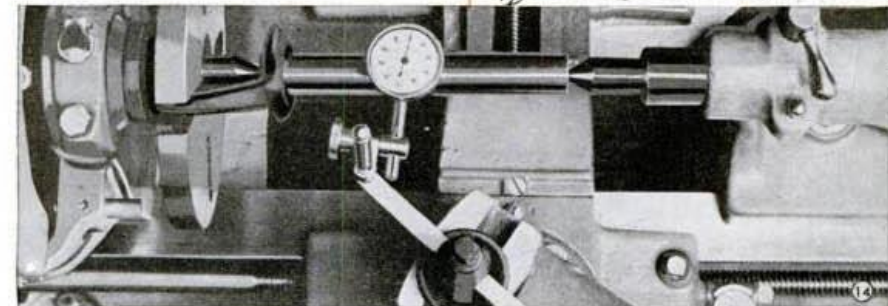
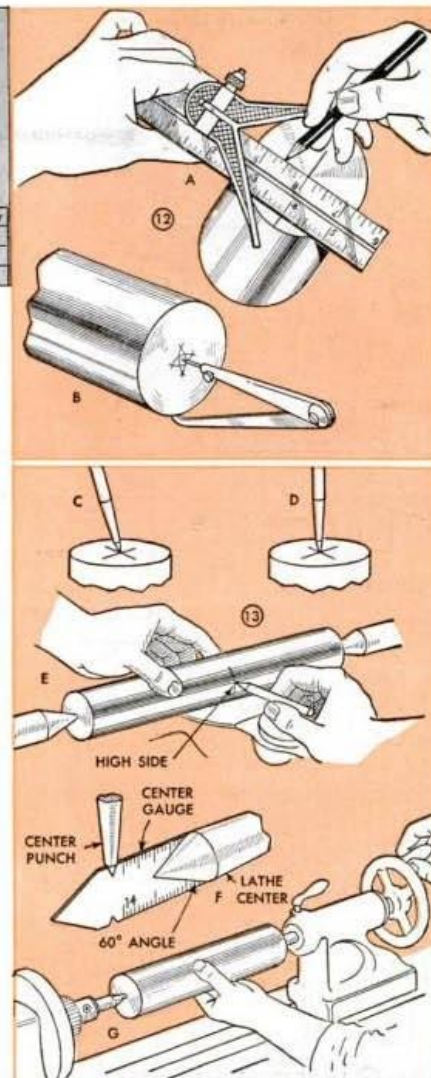
tric and straight to within .001 in. By using a bar of this kind, the spindles can be realigned easily after the tailstock has been offset for taper turning. Fig. 7 shows another bar used to test alignment of spindle bearings. This bar is about 6 in. long, and tapers from a diameter of 1 in. to fit the spindle.

Centering the work: After the lathe has been tested and put in good working order, it is ready for turning. First, center holes must be drilled in the ends of the work. These must be drilled so that the angle of the countersunk holes is identical with that of the lathe centers. Although the headstock center rotates with the work, the center hole drilled at this end of the work must be made as carefully as that at the tailstock end, or inaccurate work will result. In Fig. 8, center holes of the work are shown in relation to lathe centers. Details A and B show accurate center holes produced with a center drill having a full length



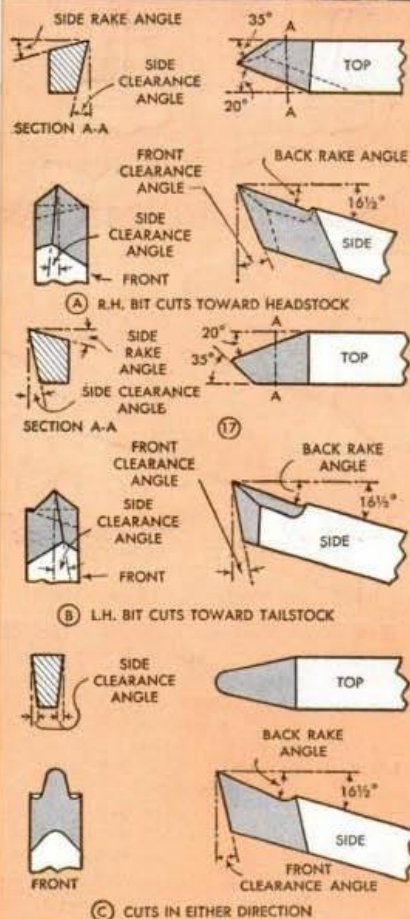
body. As the point of the drill has to be ground often, it becomes shorter. Detail C shows how an accurate lathe center fits the hole, and detail D indicates how the point of the lathe center bears against the bottom of a shallow hole made with a short drill. Details E and F show accurate work centers, but lathe centers having wrong angles. Fig. 11 shows a center drill and a table of correct drill sizes for work of specified diameters, the larger the work diameter, the deeper the countersinking required.

The tailstock center, of course, gets the most wear since it remains stationary while the work rotates on it. Conventional lathe centers are made of good quality tool steel hardened and correctly ground. They must fit the bores of spindle and tailstock ram snugly, and the point must be ground precisely. Fig. 9 shows three common types of tailstock centers. The one in detail A will outwear 25 carbon-steel centers; that shown in detail B is intended for heavy work, and the one in detail C has the advantage of carrying lubricant directly to the work center. As the headstock center rotates, it must be concentric so that it runs true if the work is also to be concentric with the center holes after being turned. If the ends of the spindle and lathe center are prick-punched as in Fig. 10, these parts can be realigned easily to their original concentricity when the center is replaced after being removed.



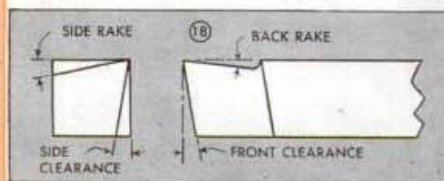


16 TOOL POSITIONED FOR GREATEST CUTTING STRENGTH



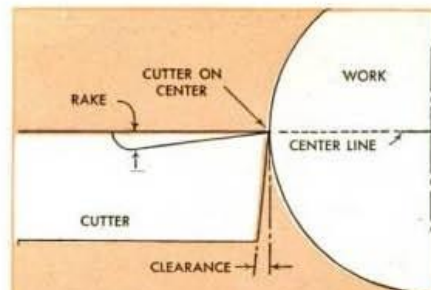
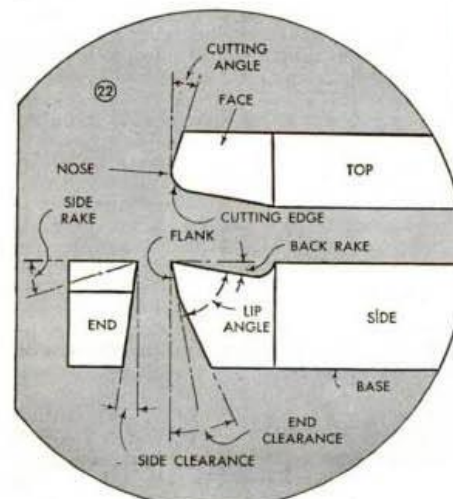
The most dependable method of locating centers on the work is to use the center head of a combination square as shown in detail A of Fig. 12. However, centers may be located also with hermaphrodite calipers as shown in detail B. In either case, both ends of the bar should be square with the sides to within at least $\frac{1}{64}$ in. When the exact center is determined, the location is prick-punched lightly to a depth not exceeding $\frac{1}{64}$ in., the work being held vertically in a vise and the punch perpendicular to the surface as in detail D of Fig. 13. If, after punching and mounting in the lathe, the work is not concentric, the runout, or high side, can be detected easily by holding a piece of chalk on the tool rest close to the work while it is being rotated slowly as shown in detail E of Fig. 13. Or, a dial indicator, shown in Fig. 14, can be used. This is a valuable instrument for accurately testing many different lathe operations, as it can detect errors of .001 in.

Runout error can be corrected by re-centering, at both ends if necessary, striking the punch while holding it at an angle toward the high side, as indicated in detail C of Fig. 13. Detail F of Fig. 13 shows the lathe center being checked for accuracy of point angle with a center gauge, which can be used also to test the point angle of the prick punch. When center-

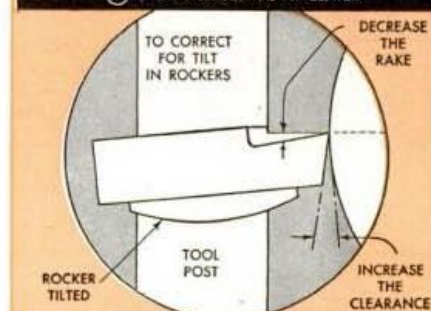


ing has been completed, the ends are punched again to deepen the impression, and then center-drilled. This is done by means of the tailstock ram as in detail G, by advancing the work slowly against the drill, which should be run at a fairly high speed, oil being used on the drill point.

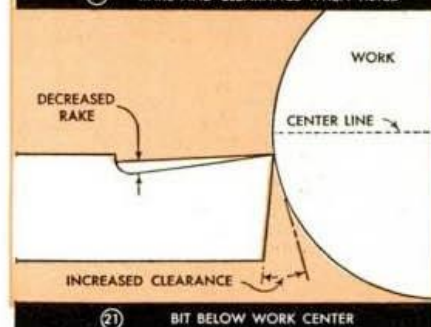
The cutting tools: Heat is produced by all metal-cutting operations and must be carried away from the cutting edge of the tool as quickly as possible. A cutting tool must do three things: remove chips, direct chips away from the work, Fig. 3, and conduct away the heat produced. Three designs of tool bits ordinarily used for most turning operations are shown in Fig. 17. Detail A shows a right-hand tool intended to cut toward the head stock; detail B pictures a left-hand tool (exact opposite of A) for turning toward the tailstock and detail C shows the type used for turning in both directions, the side rake being altered accordingly. Before attempting to grind cutter bits, the operator should know exactly what is meant by clearance, rake, cutting-edge angles, etc., as given in Fig. 22. All cutting tools must have clearance under the cutting edges so that the side and end surfaces of the tool that are below its cutting edge will not contact the work. Clearance angles of 8 to 10 deg. are used generally for metal-turning lathe tools, based on a horizontal position of the tool at the centerline of the work. A clearance angle usually includes a primary clearance or relief angle which is just below the cutting edge, and a "secondary clearance" angle. Having a relief angle minimizes the amount of metal that must be removed when resharping the edge.



19 BIT HORIZONTAL AT CENTER

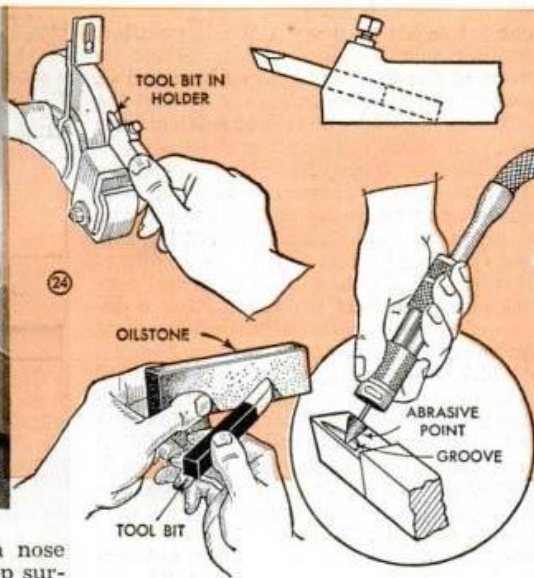


20 RAKE AND CLEARANCE WHEN TILTED



21 BIT BELOW WORK CENTER

Rake is the slope on the face of the tool, away from the cutting edge. A tool may have either side rake, back rake or both. The lip angle of a cutting edge is measured from the face to the inclined edge just under the cutting edge. Often the side and end cutting edges are ground at angles for different types of cutting. The angle of the side cutting edge is measured from a line parallel to the side of the tool while the angle of the end cutting edge is measured from a line at right angles to the side of the tool. The included angle between the side and end cutting edges is the nose angle and the corner where the two edges join is the



nose, which is often rounded to a nose radius. The face of the tool is its top surface, the base its underside and the shank is the body portion of the tool on which the cutting edge is ground.

Large lip angles provide greater cutting-edge strength and carry away heat more readily than small lip angles, but also require more power to force the tool into the work. Therefore, a compromise between the two is made to determine the rake angle to use.

Rake and clearance angles are based on a cutting tool held exactly horizontal and at right angles to the work with the cutting edge at the centerline of the work as shown in Fig. 19. However, when a tool is tilted as in Fig. 20, there must be corresponding changes in the rake and clearance angles compensating for the tilt. Rake and clearance angles also are altered when the cutting edge is set below the centerline of the work as in Fig. 21.

When using high-speed bits or cutters in forged holders as in Figs. 15 and 16, the degree of tilt at which the bit is held by the holder, when the latter is set horizontally in the toolpost, must also be considered in grinding rake and clearance angles differently from the normal angles as given in Fig. 18. Beginners in lathe work should purchase tool bits already ground, and should try to duplicate the original angles when regrinding the bits. Bits used in holders should not project more than necessary in order to have a strong, rigid setup which is less likely to vibrate and chatter. Rake and clearance angles vary with the kind of metal being turned.

The side and front clearance of high-speed steel bits are both 8 deg., when used

for cutting steel and cast iron. These clearances also serve for bronze and copper, but should be increased about 4 deg. for turning hard bronze and copper alloys. Clearances for most plastics vary from standard clearance angles to 15 deg. for end clearance and 20 deg. for side clearance, depending, of course, on the exact kind of material that is to be cut.

Turning steel usually requires a maximum back and side rake on cutting tools. It is advisable for the beginner to use a 12 deg. back rake and a 15 deg. side rake. Cast iron requires smaller rake angles than steel; aluminum is turned with substantially increased rake angles, while brass and copper are turned with very little rake angle to avoid "hogging" into the metal.

Grinding tool bits: Tool bits for small lathes are $\frac{1}{4}$ in., $\frac{5}{16}$ or $\frac{3}{8}$ in. square, and are easily ground free hand. The grinding wheel should be square and may have to be dressed with a wheel dresser as in Fig. 23, then given a finishing touch with an abrasive stick. The bit should be ground in its holder, this being held on the table rest as in Fig. 24, with the bit projecting from the holder for convenience in grinding only. If the nose of the bit is to be rounded, the tool is moved slowly back and forth in a reciprocating motion. After the bit has been rough-ground on the wheel, it should be touched up with an oilstone. Some tool bits, especially large ones, are ground with a groove along the cutting edge as shown in the circular detail of Fig. 24, the groove acting as a chip breaker. An abrasive point rotated in a flexible shaft is ideal for grinding the groove.

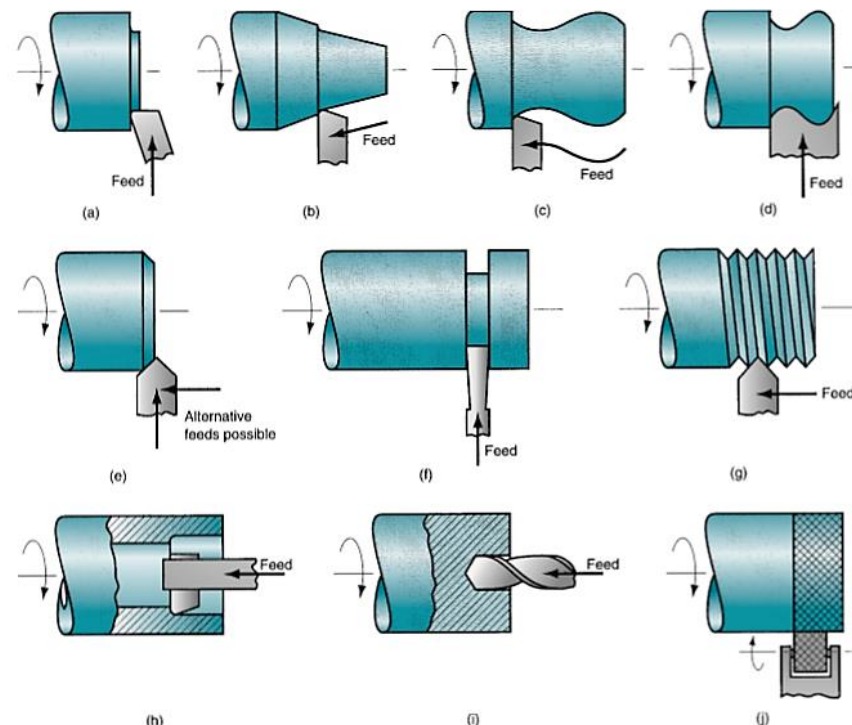
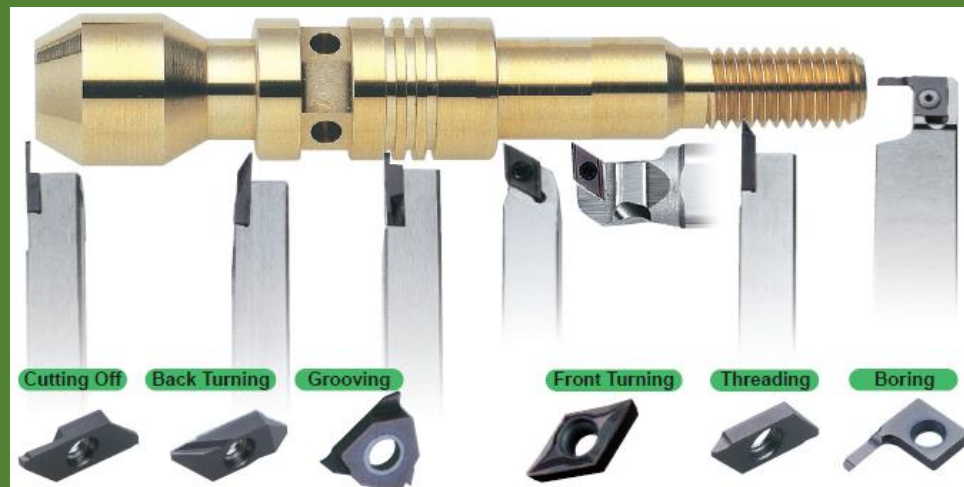


FIGURE 22.6 Machining operations other than turning that are performed on a lathe: (a) facing, (b) taper turning, (c) contour turning, (d) form turning, (e) chamfering, (f) cutoff, (g) threading, (h) boring, (i) drilling, and (j) knurling.



Composites

- Composites are a combination of materials: plywood and particle board are composites, so are paper mache, plastics, rubbers, latex, fiberglass, and carbon fibers
- This class of building medium heavily relies on molds and binders – adhesives / epoxies; just like working with metal and wood, plan ahead what part you'd like to make and create the mold; rubber, fiberglass,
- Many composites have the strength of metal but the ease of woodworking; all woodworking tools will cut and shape composites without the need for special blades



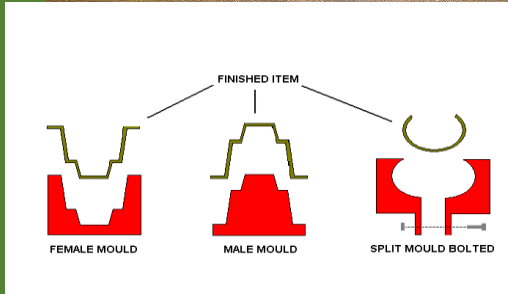
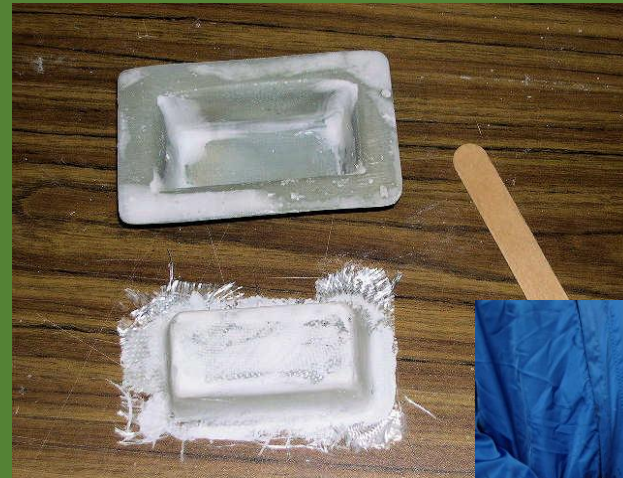
Fiberglass

•Fiberglass molding uses sheets of material (thinner than fiberglass insulation) that is placed over a mold and then exposed to poly-resin and a chemical hardening agent to stiffen the material sheet

•The final product is a near perfect, lightweight, non-conductive, and durable mold of most anything needed

•Good for automotive, marine, aircraft, and industrial uses

•May require curing in a 500° oven if rigidity is desired



Carbon Fiber

- Carbon fiber is similar to fiberglass, but has greater strength, hardness, and less ductility; is a little more expensive

- Worked by the same molding process as fiberglass, but the epoxy's are different, definitely needs vacuum molding to keep it's shape, and the oven for curing must be hotter

- Vacuum molding is when the mold and part are coated with epoxy, and then placed in a vacuum bag to evacuate all air inside to cure – remove from the bag before heating both part and mold in shop oven

- Will adhere to fiberglass for joint or corner strengthening, but use the right epoxy to stick both together

- Used for practically any application



Silicone Moldings

•Silicone molding is similar to metal casting, without the high heat (requires no heat!) or foundry sand

•Silicone comes in two distinct types: food grade and construction grade; if the mold is used for candy-making or anything edible, do not ever use construction silicone

•For food grade silicone molds: prepare the molds by creating a positive form for the silicone to shape itself around (made from clay, play-doh, or anything hard) and place this form into a disposable container, then add water to a measure of powdered silicone and pour into the mold – wait 2 days minimum for the solution to harden and cure; remove, wash, and use

•For construction grade molds, see the next slide



Latex

• Latex has many similar properties to rubber: but doesn't have high costs in time, materials, and equipment; requires no heating to make it malleable; and can be shaped on most molds – even on people

• Simply mix water with powdered latex into proper viscosity or buy pre-mixed; can be painted onto the mold, or poured into a negative – both work well

• If using latex as a mold, it can hold a highly detailed negative shape for concrete or silicone work



Rubber

•Melting rubber is difficult, but possible; rubber does release fumes that can be toxic in large doses (collect fumes by melting under a hood with a filtration unit attached)

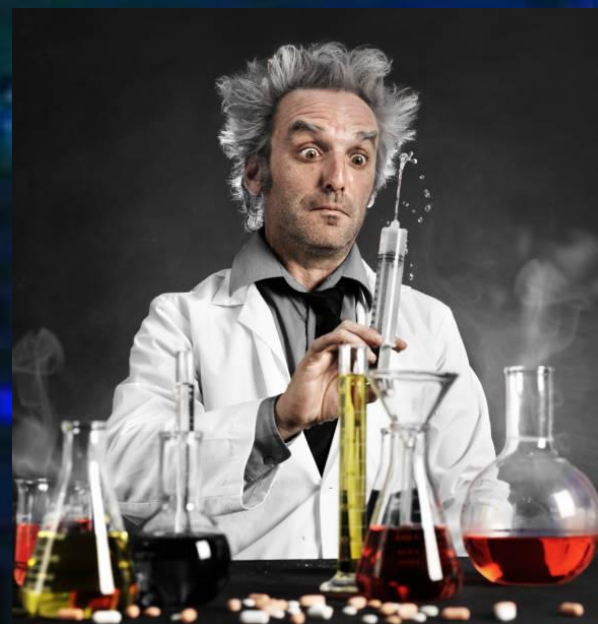
•To melt: shred a car tire and keep only the butyl rubber shreds; using a radiating heater (not direct flame) coat a metal container with a good amount of mineral oil and add rubber – melts at 1500° F

•Pour rubber into molds or onto a prepared surface as a sealant



Practical Chemistry

- Unlike the stress inducing K-12 chemistry classes this is understandable and productive
- Chemicals we use everyday are easier to make than folks realize; bleach is the result of electrolysis of salt water, most pharmaceuticals are different formulas of salts, soap is a mix of alkali and fats
- Equipment for the amateur chemist cobbled together from mason jars, measuring spoons, and wall outlet plugs have lead to most scientific discoveries of the 19th and 20th centuries – usually by accident!
- A great book to begin chemistry at home is The Golden Book of Chemistry Experiments available for free:
https://archive.org/details/the_golden_book_of_chemistry_experiments

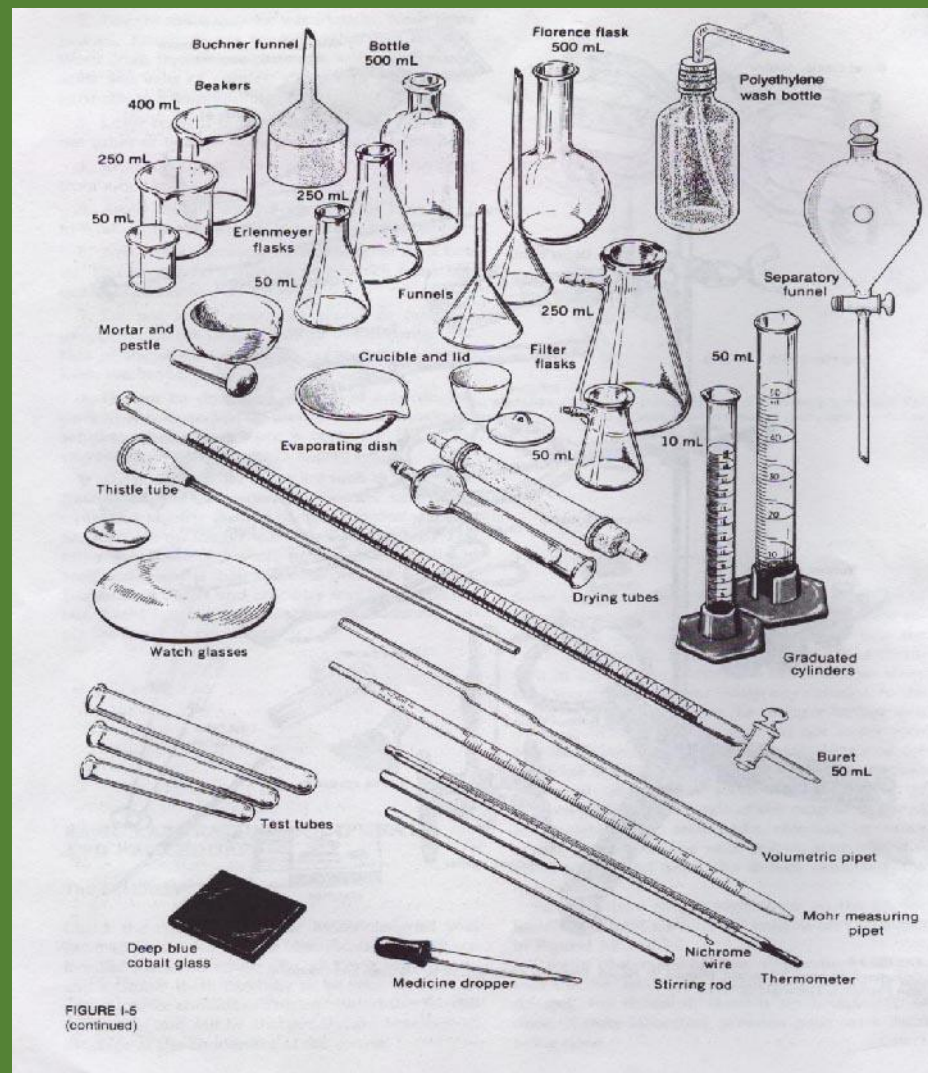


Setting Up the Chemical Lab

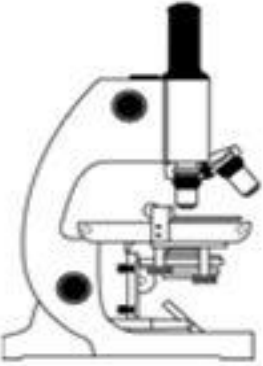
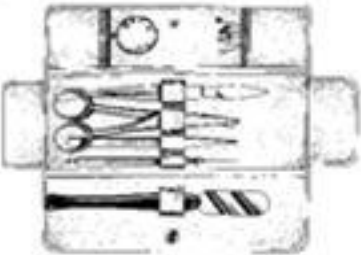










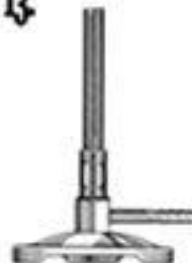















•Some of the greatest discoveries in history were made by 'common folks' with no specialized equipment, but what was at hand: a 25¢ mason jar is just as good as a \$20 Erlenmeyer flask

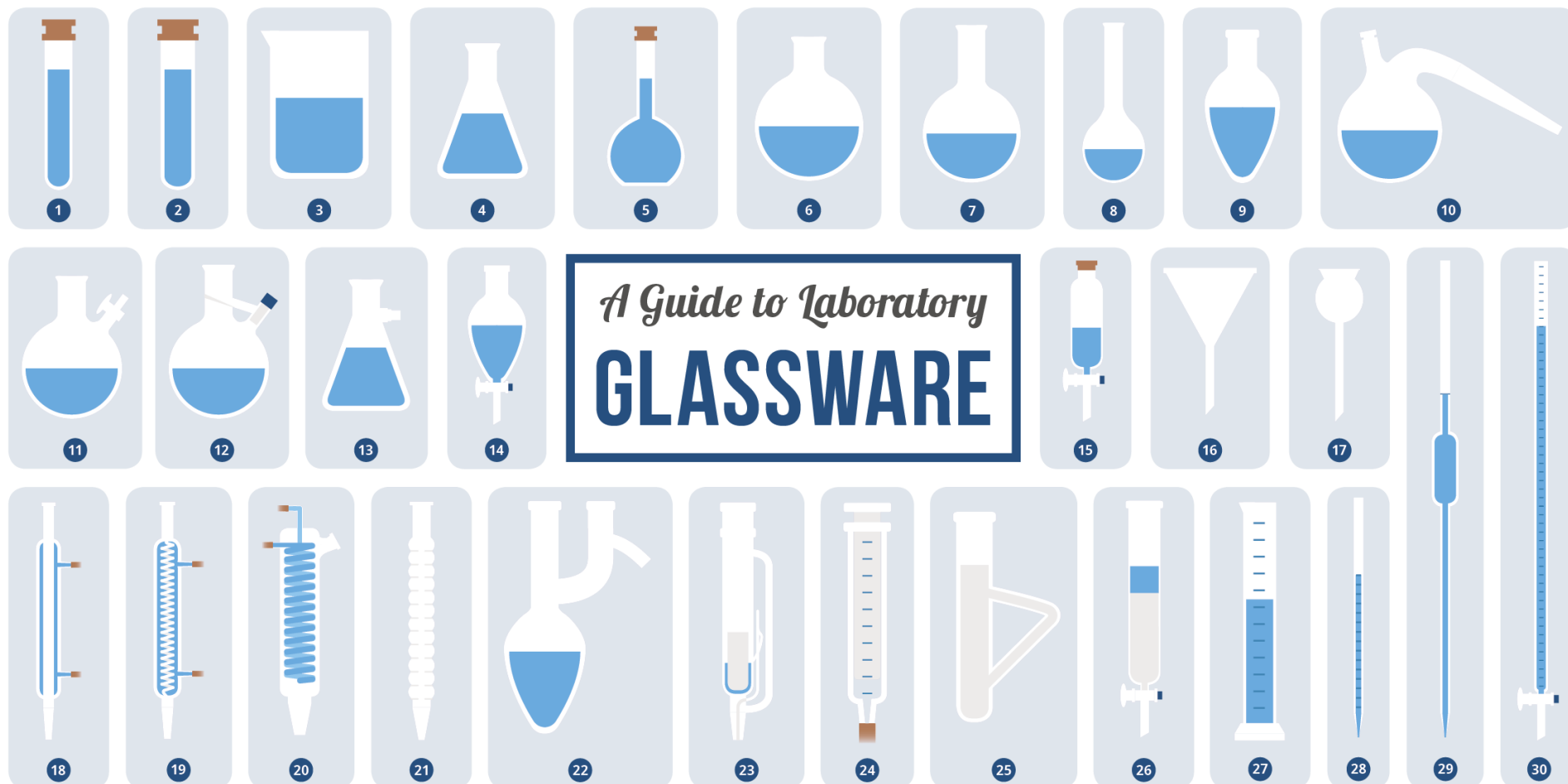
•Regular laboratory equipment is needed with the more complicated formulas and when producing large amounts of product faster and far more efficiently

•Be sure to clean equipment after every use; residues can ruin desired chemical reactions, and if making something medicinal – residues can alter the cure into a poison



Science Lab Tools

<p>1.</p> 	<p>2.</p> 	<p>3.</p>  <p>4.</p>  <p>5.</p> 	<p>6.</p>  <p>7.</p>  <p>8.</p> 
<p>9.</p>  <p>10.</p>  <p>11.</p> 	<p>12.</p>  <p>13.</p> 	<p>14.</p>  <p>15.</p>  <p>16.</p>  <p>17.</p> 	<p>18.</p> 
<p>19.</p>  <p>20.</p>  <p>21.</p> 	<p>22.</p>  <p>23.</p> 	<p>24.</p>  <p>25.</p>  <p>26.</p> 	<p>27.</p>  <p>28.</p> 
<p>1. Microscope 2. Dissecting Kit 3. Erlenmeyer Flask 4. Rubber Stopper 5. Florence Flask 6. Test Tube Brush 7. Test Tube</p>	<p>8. Test Tube Rack 9. Ring Clamp 10. Test Tube Holder 11. Test Tube Clamp 12. Ring Stand 13. Bunsen Burner 14. Medicine Dropper/Pipette</p>	<p>15. Graduated Cylinder 16. Funnel 17. Stirring Rod 18. Beaker 19. Tweezers 20. Cover Slips 21. Microscope Slide</p>	<p>22. Mortar and Pestle 23. Thermometer 24. Meter Stick 25. Triple Beam Balance 26. Safety Goggles 27. Petri Dish 28. Magnifying Glass</p>



A Guide to Laboratory
GLASSWARE

- | | | | | | |
|----------------------------|------------------------|----------------------|-------------------------|----------------------|--------------------------|
| 1 Test tube | 6 Round-bottomed flask | 11 Schlenk flask | 16 Filter funnel | 21 Distilling column | 26 Chromatography column |
| 2 Boiling Tube | 7 Florence flask | 12 Straus flask | 17 Thistle funnel | 22 Claisen flask | 27 Graduated cylinder |
| 3 Beaker | 8 Kjeldahl Flask | 13 Buchner Flask | 18 Liebig condenser | 23 Soxhlet extractor | 28 Graduated pipette |
| 4 Conical/Erlenmeyer flask | 9 Pear-shaped flask | 14 Separating funnel | 19 Graham condenser | 24 Gas syringe | 29 Volumetric pipette |
| 5 Volumetric flask | 10 Retort flask | 15 Dropping funnel | 20 Friedrichs condenser | 25 Thiele tube | 30 Burette |



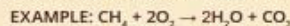
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COMBUSTION



COMBUSTION REACTIONS INVOLVE OXYGEN REACTING WITH ANOTHER ELEMENT OR COMPOUND TO PRODUCE ENERGY IN THE FORM OF HEAT AND LIGHT. THEY ARE ALWAYS EXOTHERMIC. COMPLETE COMBUSTION REQUIRES A PLENTIFUL SUPPLY OF OXYGEN - IN A LIMITED SUPPLY, INCOMPLETE COMBUSTION OCCURS, AND DIFFERENT PRODUCTS ARE FORMED. WHEN ORGANIC CHEMICALS COMBUST COMPLETELY, THE PRODUCTS ALWAYS INCLUDE CARBON DIOXIDE AND WATER.

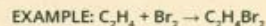


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ADDITION



ADDITION REACTIONS, ALSO KNOWN AS SYNTHESIS REACTIONS OR DIRECT COMBINATION REACTIONS, INVOLVE TWO OR MORE REACTANTS COMBINING TO FORM A SINGLE MORE COMPLEX PRODUCT. EXAMPLES ARE THE REACTION OF IRON AND SULFUR TO FORM IRON SULFIDE, OR, IN ORGANIC CHEMISTRY, THE REACTION OF ETHENE & BROMINE TO FORM DIBROMOETHANE.



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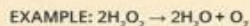
CHEMICAL REACTIONS

PART I

DECOMPOSITION



A DECOMPOSITION REACTION INVOLVES THE BREAKING DOWN OF A CHEMICAL COMPOUND INTO ELEMENTS OR SIMPLER COMPOUNDS. IT IS SOMETIMES DEFINED AS THE OPPOSITE OF SYNTHESIS REACTIONS. THEY CAN OCCUR SPONTANEOUSLY, OR BE INITIATED BY HEAT, A CATALYST, OR ELECTROLYSIS. AN EXAMPLE IS THE DECOMPOSITION OF HYDROGEN PEROXIDE INTO WATER & OXYGEN.

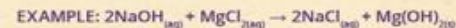


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PRECIPITATION



A PRECIPITATE REACTION IS ONE IN WHICH AQUEOUS COMPOUNDS REACT TO FORM AN INSOLUBLE SOLID, CALLED A PRECIPITATE. THIS SOLID CAN BE SUSPENDED THROUGHOUT THE SOLUTION, OR FALL TO THE BOTTOM OF THE REACTION VESSEL. WHETHER OR NOT A REACTION WILL FORM A PRECIPITATE IS DICTATED BY SOLUBILITY RULES FOR IONIC COMPOUNDS.



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NEUTRALISATION

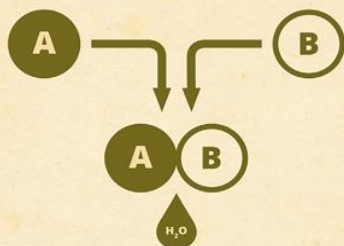


A NEUTRALISATION REACTION IS ONE IN WHICH AN ACID AND A BASE REACT TO FORM A SALT. WATER IS COMMONLY PRODUCED AS WELL. OFTEN THESE REACTIONS ARE EXOTHERMIC, BUT ENDOTHERMIC NEUTRALISATION REACTIONS ARE POSSIBLE. NEUTRALISATION REACTIONS DO NOT NECESSARILY RESULT IN A pH OF 7 - RESULTANT pH IS DEPENDENT ON THE STRENGTHS OF THE ACID & BASE.



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CONDENSATION

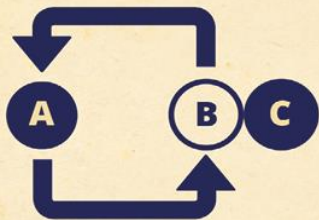


A CONDENSATION REACTION IS ONE IN WHICH TWO MOLECULES COMBINE TO FORM A LARGER MOLECULE, WITH THE LOSS OF A SMALL MOLECULE. THE SMALL MOLECULE LOST IS USUALLY WATER, BUT NOT ALWAYS. IT CAN BE CONSIDERED TO BE THE OPPOSITE OF HYDROLYSIS REACTIONS. IT IS AN IMPORTANT REACTION IN THE MANUFACTURE OF MANY POLYMERS.

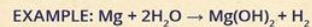


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DISPLACEMENT



A DISPLACEMENT REACTION IS WHEN AN ELEMENT OR ION MOVES OUT OF ONE COMPOUND INTO ANOTHER. IT USUALLY OCCURS IF THE ELEMENT MOVING INTO THE COMPOUND IS MORE REACTIVE THAN THE ELEMENT IT DISPLACES. DOUBLE DISPLACEMENT REACTIONS ALSO OCCUR, WHERE ANIONS & CATIONS OF TWO DIFFERENT MOLECULES SWAP PLACES, FORMING TWO DIFFERENT COMPOUNDS.

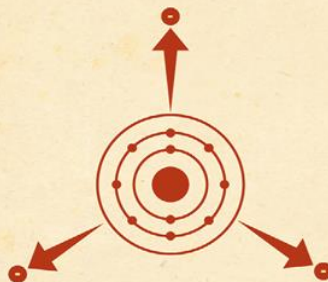


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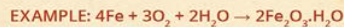
CHEMICAL REACTIONS

PART II

OXIDATION



OXIDATION REACTIONS ARE SOMETIMES DEFINED AS REACTIONS IN WHICH OTHER ELEMENTS 'GAIN', OR FORM BONDS WITH, OXYGEN ATOMS. MORE GENERALLY, THEY CAN BE DEFINED AS REACTIONS IN WHICH ATOMS OF AN ELEMENT LOSE ELECTRONS. OXIDATION DOES NOT OCCUR WITHOUT AN ACCOMPANYING REDUCTION - THESE REACTIONS ARE KNOWN AS REDOX REACTIONS.

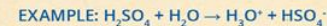


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HYDROLYSIS

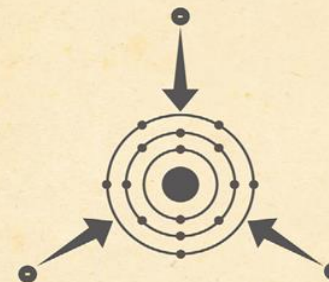


A HYDROLYSIS REACTION INVOLVES THE BREAKING OF CHEMICAL BONDS BY THE ADDITION OF WATER TO A SUBSTANCE. IN SOME CASES, THIS ADDITION CAN CAUSE BOTH THE SUBSTANCE AND THE WATER MOLECULE TO SPLIT INTO TWO PARTS. THERE ARE THREE MAIN TYPES OF HYDROLYSIS: SALT, ACID & BASE. DISSOLVING SULFURIC ACID IN WATER IS A SIMPLE EXAMPLE OF HYDROLYSIS.

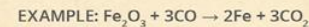


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REDUCTION



REDUCTION REACTIONS ARE SOMETIMES DEFINED AS CHEMICAL REACTIONS IN WHICH OTHER ELEMENTS 'LOSE' OXYGEN ATOMS. MORE GENERALLY, THEY CAN BE DEFINED AS REACTIONS IN WHICH ATOMS OF AN ELEMENT GAIN ELECTRONS. REDUCTION DOES NOT OCCUR WITHOUT AN ACCOMPANYING OXIDATION REACTION - THESE REACTIONS ARE KNOWN AS REDOX REACTIONS.



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3
Li
Lithium

11
Na
Sodium

19
K
Potassium

37
Rb
Rubidium

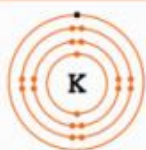
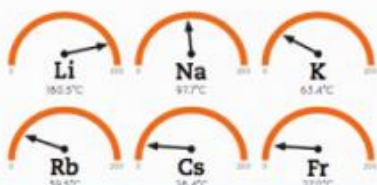
55
Cs
Caesium

87
Fr
Francium

Group 1 - The Alkali Metals

THE GROUP 1 ELEMENTS ARE SHINY, SOFT, AND HIGHLY REACTIVE METALS, NONE OF WHICH OCCUR NATURALLY AS FREE ELEMENTS

MELTING POINTS



ALL OF THE GROUP 1 METALS HAVE **ONE** VALENCE ELECTRON

THE REACTIVITY OF THE GROUP 1 METALS **INCREASES DOWN THE GROUP** AS THE OUTER ELECTRON GETS FURTHER FROM THE NUCLEUS & BECOMES EASIER TO REMOVE

THE ALKALI METALS REACT WITH WATER TO FORM METAL HYDROXIDES



ALKALI METALS REACT WITH OXYGEN TO FORM METAL OXIDES



ALKALI METALS REACT WITH HALOGENS TO FORM IONIC SALTS

USES OF THE ALKALI METALS

LITHIUM ANTI-DEPRESSANTS BATTERIES	SODIUM STREET LAMPS TABLE SALT	POTASSIUM FERTILISERS SOAPS	RUBIDIUM & CAESIUM ATOMIC CLOCKS	FRANCIUM RADIOACTIVE
--	--------------------------------------	-----------------------------------	-------------------------------------	-------------------------

4
Be
Beryllium

12
Mg
Magnesium

20
Ca
Calcium

38
Sr
Strontium

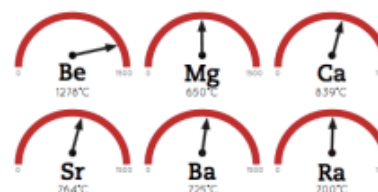
56
Ba
Barium

88
Ra
Radium

Group 2 - The Alkaline Earth Metals

THE GROUP 2 ELEMENTS ARE SHINY, SILVERY-WHITE, AND SOMEWHAT REACTIVE METALS, SOME OF WHICH OCCUR NATURALLY AS FREE ELEMENTS

MELTING POINTS



ALL OF THE GROUP 2 METALS HAVE **TWO** VALENCE ELECTRONS

THE REACTIVITY OF THE GROUP 2 METALS **INCREASES DOWN THE GROUP** AS THE OUTER ELECTRONS GET FURTHER FROM THE NUCLEUS & BECOME EASIER TO REMOVE
THEY ARE LESS REACTIVE THAN GROUP 1

THE ALKALINE EARTH METALS REACT WITH WATER TO FORM METAL HYDROXIDES...



EXCEPT FOR BERYLLIUM WHICH HAS A PROTECTIVE OXIDE LAYER PREVENTING REACTION

GROUP 2 METALS REACT WITH OXYGEN TO FORM METAL OXIDES



GROUP 2 METALS REACT WITH HALOGENS TO FORM METAL HALIDES

RADIUM IS A RADIOACTIVE ELEMENT WHICH IS USED TO BE USED TO MAKE GLOW IN THE DARK PAINT

USES OF THE ALKALINE EARTH METALS

BERYLLIUM EMERALDS TELESCOPE MIRRORS	MAGNESIUM ALLOY WHEELS FLARES	CALCIUM BONES BLACKBOARD CHALK	STRONTIUM FIREWORKS TREATING OSTEOPOROSIS	BARIUM RAT POISON GLASSMAKING
--	-------------------------------------	--------------------------------------	---	-------------------------------------

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5
B
Boron

13
Al
Aluminium

31
Ga
Gallium

49
In
Indium

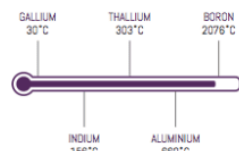
81
Tl
Thallium

113
Uut
Ununtrium

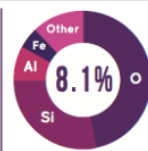
Group 3 - The Icosagens

EXCEPT FOR BORON, THE GROUP 3 ELEMENTS ARE ALL METALS, KNOWN AS 'POOR METALS' DUE TO THEIR LOW MELTING POINTS & HARDNESS

MELTING POINTS



BORON IS A METALLOID AND THE ONLY NON-METAL IN GROUP 3



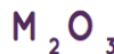
ALUMINIUM IS THE THIRD MOST ABUNDANT ELEMENT IN THE EARTH'S CRUST AND THE MOST ABUNDANT METAL

GROUP 3 ELEMENTS REACT WITH OXYGEN TO FORM METAL OXIDES

1 GRAM



THE AVERAGE LETHAL DOSE FOR THE TOXIC ELEMENT THALLIUM



USES OF THE ICOSAGENS

BORON GLASSWARE DETERGENT	ALUMINIUM DRINK CANS AIRCRAFT BODIES	GALLIUM ELECTRONIC COMPONENTS	INDIUM TOUCH SCREENS	THALLIUM RAT POISON
---------------------------------	--	----------------------------------	-------------------------	------------------------

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6
C
Carbon

14
Si
Silicon

32
Ge
Germanium

50
Sn
Tin

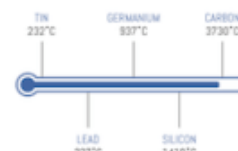
82
Pb
Lead

114
Fl
Flerovium

Group 4 - The Crystallogens

THE GROUP 4 ELEMENTS ARE A MIX OF METALS, METALLOIDS & NON-METALS, AND SHOW CONSIDERABLE DIVERSITY IN THEIR PROPERTIES

MELTING POINTS



SILICON IS THE SECOND MOST ABUNDANT ELEMENT IN THE EARTH'S CRUST AT **25.7%**



ALL OF THE GROUP 4 ELEMENTS HAVE **FOUR** VALENCE ELECTRONS

EXPOSURE TO LEAD CAN CAUSE LEAD POISONING



FLEROVIUM IS ONE OF THE MAN-MADE ELEMENTS DISCOVERED IN 1999

1999

8

THE NUMBER OF ALLOTROPES OF CARBON INCLUDING DIAMOND, GRAPHITE & BUCKMINSTER FULLERENE



TIN IS THE ELEMENT WITH THE LARGEST NUMBER OF STABLE ISOTOPES

THE GROUP FOUR ELEMENTS FORM HYDRIDES WITH HYDROGEN EH_4 TETRAHALIDES WITH HALOGENS EX_4 AND A VARIETY OF OXIDES WITH OXYGEN

CARBON MAKES UP **18.5%** OF THE HUMAN BODY



IT ALSO FORMS ORGANIC COMPOUNDS THE STUDY OF WHICH IS KNOWN AS ORGANIC CHEMISTRY

USES OF THE CRYSTALLOGENS

CARBON DIAMONDS CARBON DATING	SILICON GLASS ELECTRONICS	GERMANIUM MICROSCOPE & CAMERA LENSES	TIN TIN CANS	LEAD RADIATION SHIELDING LEADED PETROL
-------------------------------------	---------------------------------	---	-----------------	--

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7
N

Nitrogen

15
P

Phosphorus

33
As

Arsenic

51
Sb

Antimony

83
Bi

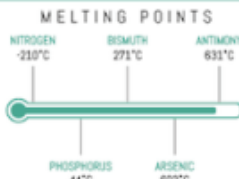
Bismuth

115
Uup

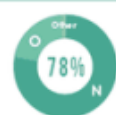
Ununpentium

Group 5 - The Pnictogens

THE GROUP 5 ELEMENTS ARE ALL SOLIDS APART FROM NITROGEN, AND ARE A MIX OF NON-METALS, METALLOIDS AND A METAL



BISMUTH
IS THE ONLY
METALLIC
ELEMENT
PRESENT
IN GROUP FIVE



NITROGEN IS
THE MOST
ABUNDANT ELEMENT
IN THE EARTH'S ATMOSPHERE

THE PNICTOGENS
FORM PNICTIDES
WITH MOST ELEMENTS

PHOSPHORUS
CONTAINING
CALCIUM PHOSPHATE
COMPOUNDS
MAKE UP

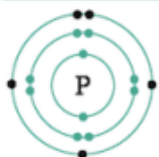
PNICTOGENS FORM:
HYDRIDES
WITH HYDROGEN
OXIDES
WITH OXYGEN
HALIDES
WITH HALOGENS

70%
OF HUMAN
BONE

USES OF THE PNICTOGENS

NITROGEN EXPLOSIVES FERTILISERS	PHOSPHORUS SAFETY MATCHES SHOE BOMBS	ARSENIC AMMUNITION MANUFACTURING	ANTIMONY FLAME RETARDANTS COSMETICS	BISMUTH X-RAY SHIELDS MEDICINES

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ALL OF THE
GROUP 5 ELEMENTS
HAVE
FIVE
VALENCE ELECTRONS

ANCIENT EGYPTIANS
USED THE
ANTIMONY COMPOUND
CALLED STIBNITE AS
EYE MAKE-UP



0.06 LETHAL DOSE
GRAMS OF ARSENIC

9
F

Fluorine

17
Cl

Chlorine

35
Br

Bromine

53
I

Iodine

85
At

Astatine

117
Uus

Ununseptium

Group 7 - The Halogens

GROUP 7 IS THE ONLY GROUP THAT CONTAINS ELEMENTS IN ALL THREE STATES OF MATTER. THEY ARE ALL REACTIVE NON-METALS



THE
HALOGENS
ALL FORM
DIATOMIC
MOLECULES
EXCEPT
FOR
ASTATINE



HYDROFLUORIC ACID
LEACHES CALCIUM FROM
BONES AND CAN CAUSE
VERY PAINFUL BURNS

IT ALSO
DISSOLVES GLASS

THE HALOGENS
REACT WITH
OXYGEN TO FORM
HALOGEN OXIDES

THE HALOGENS
ARE USED AS
OXIDISING AGENTS
WHILST
HALIDE IONS
ARE USED AS
REDUCING AGENTS

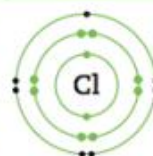
THE HALOGENS
REACT WITH
METALS TO FORM
METAL HALIDES



USES OF THE HALOGENS

FLUORINE TOOTHPASTE REFRIGERANT GASES	CHLORINE BLEACH CHEMICAL WARTFARE	BROMINE FIRE RETARDANT MATERIALS	IODINE DISINFECTANTS

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ALL OF THE
GROUP 7 ELEMENTS
HAVE
SEVEN
VALENCE ELECTRONS

THE REACTIVITY OF THE HALOGENS
DECREASES DOWN THE GROUP
AS IT BECOMES HARDER TO
ADD AN ELECTRON

1 GRAM
ESTIMATED AMOUNT OF
ASTATINE
IN THE EARTH'S CRUST
AT ANY ONE TIME

8
O

Oxygen

16
S

Sulphur

34
Se

Selenium

52
Te

Tellurium

84
Po

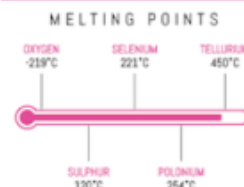
Polonium

116
Lv

Livermorium

Group 6 - The Chalcogens

THE GROUP 6 ELEMENTS ARE A MIX OF ELECTRONEGATIVE NON-METALS & METALLOIDS COMMONLY ASSOCIATED WITH METAL BEARING MINERALS



ALL OF THE
SOLID
CHALCOGENS
ARE SOFT
AND
DON'T CONDUCT
HEAT WELL

OXYGEN
MAKES UP
65%
OF THE
HUMAN BODY



ALL OF THE
COMPOUNDS OF
HYDROGEN WITH
CHALCOGENS
ARE TOXIC



APART FROM WATER

OXYGEN
IS THE ONLY
GASEOUS
CHALCOGEN

SELENIUM,
TELLURIUM &
POLONIUM
ARE ALL
METALLOIDS

ALLOTROPES

OXYGEN
NINE
 O_2 , O_3 , O_4 , O_6

SULPHUR
TWENTY
 S_2 , S_3 , S_4 , S_6

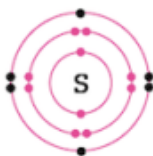
SELENIUM
FIVE
MAINLY Se_8

POLONIUM
TWO
 α -Po & β -Po

USES OF THE CHALCOGENS

OXYGEN MAKING STEEL ROCKET FUEL	SULPHUR GUNPOWDER SULPHURIC ACID	SELENIUM PHOTOCOPIERS GLASS-MAKING	TELLURIUM CD-RW DISCS SOLAR PANELS	POLONIUM ALPHA PARTICLE GENERATOR IN RESEARCH

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ALL OF THE
GROUP 6 ELEMENTS
HAVE
SIX VALENCE
ELECTRONS

ALL THE GROUP 6 ELEMENTS
FORM - 2 IONS
WHEN REACTING WITH
ELECTROPOSITIVE METALS

SULPHUR DIOXIDE
REACTS WITH WATER VAPOUR
TO FORM SULPHURIC ACID
AND CAUSE ACID RAIN

2
He

Helium

10
Ne

Neon

18
Ar

Argon

36
Kr

Krypton

54
Xe

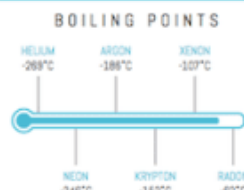
Xenon

86
Rn

Radon

Group 8 - The Noble Gases

THE GROUP 8 ELEMENTS ARE ALL ODOURLESS, COLOURLESS, MONOATOMIC GASES WITH A VERY LOW CHEMICAL REACTIVITY



THE
NOBLE GASES
ARE ALL
MONOATOMIC
AND
RARELY FORM
COMPOUNDS

THE COLOURS IN 'NEON' SIGNS
ARE CAUSED BY IONISED NOBLE GASES

He Ne Ar Kr Xe

1
H
75%

2
He
23%

3
O
1%

HELIUM
IS THE
SECOND MOST
ABUNDANT ELEMENT
IN THE UNIVERSE



USES OF THE NOBLE GASES

HELIUM BALLOONS	NEON NEON LIGHTS REFRIGERANT	ARGON MEDICAL LASERS LIGHT BULBS	KRYPTON CAMERA FLASHES	XENON MEDICAL IMAGING

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ALL OF THE
GROUP 8 ELEMENTS
HAVE A
FULL OUTER SHELL
OF ELECTRONS

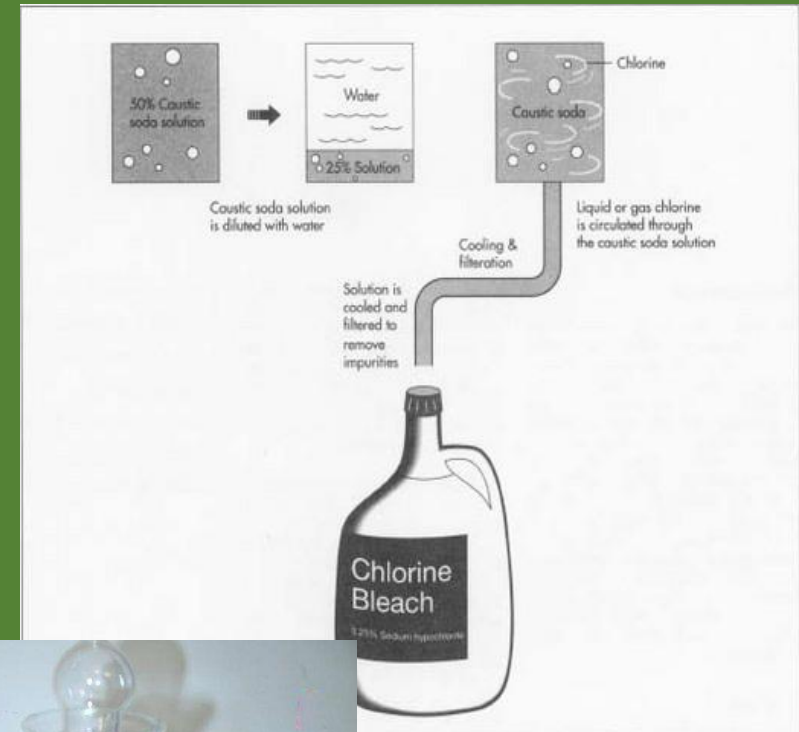
THE GROUP 8 ELEMENTS ARE
VERY UNREACTIVE
AS THEY ALREADY HAVE A
FULL VALENCE ELECTRON SHELL

-269°C
HELIUM HAS THE
LOWEST BOILING POINT
OF ALL ELEMENTS IN
THE PERIODIC TABLE

Bleach

•To make bleach: gather a 1 liter bottle, two carbon rods (two graphite pencils work very well, scrape off the paint and sharpen both ends), and two wires connected to a 9-volt battery or snip off a wall plug with a length of wire; add one handful of pure salt to 1 liter of water, insert the carbon rods and power it up – after an hour, the water will turn a pale yellow color, this is bleach (sodium hydrochloride)

•*Only perform this outdoors:* electrolysis of saltwater creates hydrogen and chlorine gas – both toxic to inhale



Soap

•Using leftover rendered fats (plant or animal), soaps are made through a process of saponification

•Be careful using lye (caustic soda) – will cause chemical burns; lye is extracted from wood ash by leeching and evaporating in a non-metal container. Roebic© Drain Opener is 100% commercial lye

•Soap is made either on stove top or in the oven; the stove top is best for small batches while the oven is better for large batches with little babysitting

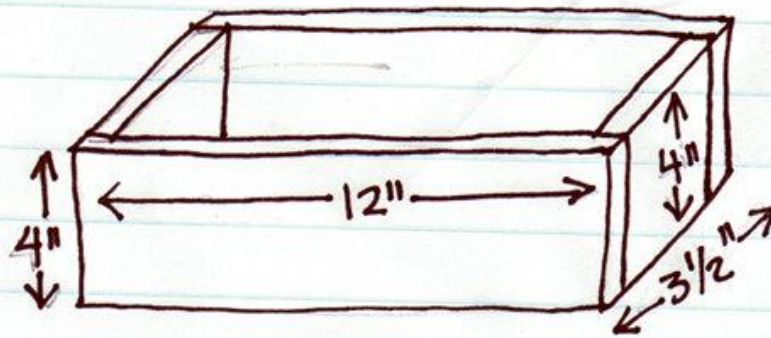
•To make basic soap: gather 30 oz fats – like tallow or lard, 4 oz lye, and 12 oz distilled water (must be done by weight, not volume); melt the fat in a double boiler; put water in a non-metal bowl and very slowly add the lye to the water (never add water to lye – makes a big mess), Move melted fat to a crockery container and mix the fats, lye and water together until it looks like custard; heat the crock on low and simmer the soap for 45-60 minutes, stir occasionally to ensure it doesn't boil over, pour into mold (line large wooden molds with wax paper for easier removal), let cool and set up, cut into bars and wrap each one in wax paper



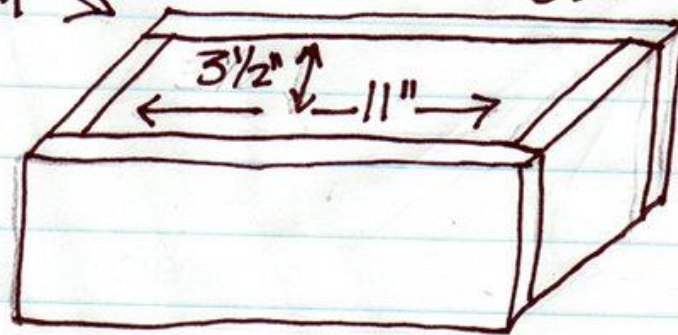
*glycerol (glycerine) - water soluble sugar alcohol is a by product of this reaction.



WOODEN LOAF SOAP MOLD
EXTERIOR DIMENSIONS = $12'' \text{L} \times 4\frac{1}{2}'' \text{W} \times 4'' \text{H}$
YIELDS $3\frac{1}{2} \text{LB.}$



BOTTOM →



WOOD
GLUE



Made with $\frac{1}{2}''$ thick craft wood

2 LONG SIDES = $12'' \times 4''$

2 SHORT SIDES = $3\frac{1}{2}'' \times 4''$

BOTTOM (FITS INSIDE) = $11'' \times 3\frac{1}{2}''$

©Soap Deli News

NATURAL GLUE RECIPE

- one third cup sugar
- one teaspoon vinegar
- one cup flour
- one and a half cups water



1. Combine flour and sugar in a saucepan.



2. Gradually add water and stir until mixture is smooth and has no clumps.



3. Pour a teaspoon of vinegar and put on medium heat. Stir until the mixture starts to thicken into a paste.



4. Cool completely and transfer to an airtight container.

HOW TO MAKE GLUE from MILK

WHAT YOU NEED:



Window and Wood Putty

- Seals and protects glass, especially stained-glass windows, from rattling, leaking, and falling out; also works as a wood filler to close gaps and cracks

- To make putty: obtain rubber gloves, measuring cup, raw linseed oil, boiled linseed oil, calcium carbonate powder, empty paint can or bucket, stirrer, powdered stove black, and putty knife; put on rubber gloves and combine 1/2 cup raw linseed oil with 1/2 cup boiled linseed oil in an empty paint can or bucket; stir the combination of linseed oils thoroughly until well mixed, add calcium carbonate powder to the mixture in 1-cup increments to make the putty light beige in color, add more cups of calcium carbonate powder to the mixture to make it lighter; store in airtight container



How to Make Plumber's Putty

- 1** Lay a sheet of wax paper about 24 inches long over your work surface to place the ingredients of your plumber's putty on and tape it down with masking tape. Before mixing the ingredients, put on latex gloves and a dust mask. Place 16 ounces of white modeling clay on the wax paper and mold the clay into a bowl shape so that it can hold about a 1/4 cup of liquid in the center.
- 2** Pour almost a 1/4 cup of linseed oil into the clay bowl, leaving about a teaspoon of liquid to be used later. Allow the oil to soak into the clay for 2 or 3 hours and then begin working the clay and oil together until it is mixed completely.
- 3** Add 2 tablespoons of powdered limestone to the clay and work it into the mixture until it is totally saturated in the material. Verify that there are no pockets of limestone that have not been worked into the mix.
- 4** Work the remainder of the linseed oil into the mixture until it has been completely dissolved by the putty compound. Place the plumber's putty into the 1 pint empty plastic container and place the lid on the jar.
- 5** Throw the wax paper away and clean up any left over toxic material to store in a safe place.

Plant Extracts

• Natural oils are the seasoning and medicinal properties in herbs and spices, and extracting these oils is not difficult; there are two methods used to create plant extracts: leeching and distilling

• To leech out plant essence: mix equal parts ethanol, glycerin, distilled vinegar, and pure water; add 1 pint of warm liquid for every 2 handfuls of chopped plants – be sure to submerge completely; leave for 2-3 weeks covered, filter and save

• To distill: place equal parts chopped plants, pure water, and ethanol into a still and run off until finished

• When tincture is ready: either allow alcohol to evaporate out and store liquid in airtight container, or heat to below boiling point (cooking out the alcohol) and add equal parts sugar to create a syrup, cool and store in airtight container for long-term storage



Homemade Aspirin

- Buffered Aspirin (acetylsalicylic acid) is the synthetic of a chemical from tree bark, namely White Willow (Salix Alba), called Salicin
- To make: prune off excess branches of the tree and cut off the bark; the inner pink bark is where the Salicin is, but the branches are thin enough you can use all the bark – dry and store when needed; boil some water and add 1 Tbsp. of shredded bark for every 1 cup of hot water, boil the bark for 10 minutes and remove from heat to steep for 30 minutes; filter and drink, taste will be bitter and medicinal; no more than three doses per day, 6 hours apart
- Be sure not to use when ill from a virus to prevent Reyes Syndrome; if you have problems taking aspirin, taking Salicin isn't a substitute

TREES THAT ARE NATURAL PAIN KILLERS

WWW.GONATURALPAINRELIEF.COM

1. WHITE WILLOW TREE

- THE ACETYSALICYLIC ACID IN ASPIRIN WAS DERIVED FROM THE SALICIN COMPOUND OF THE BARK OF THE WHITE WILLOW TREE
- THIS TREE GROWS NATIVELY IN EUROPEAN AND ASIAN REGIONS
- WILLOW BARK CONTAINS ABOUT 1.5% TO 11% OF SALICIN
- SALICIN INHIBITS THE COX-2 PATHWAY, SUPPRESSING THE FORMATION OF PRO-INFLAMMATORY CYTOKINES



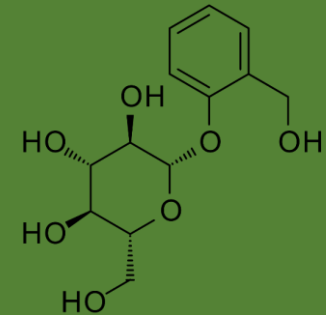
2. ASPEN TREE

- THE ASPEN TREE IS ALSO KNOWN AS THE TREMBLING ASPEN IN AMERICA
- IT WAS THE NATIVE AMERICAN INDIANS WHO TURNED TO ASPEN BARK FOR THEIR MEDICINAL NEEDS, PRIMARILY THOSE INVOLVING PAIN
- LIKE THE WILLOW TREE BARK, THE ASPEN TREE'S BARK CONTAINS SALICYLATES
- EXTRACTS FROM THE ASPEN TREE BARK CAN BE USED AGAINST ARTHRITIC PAINS OR INFLAMMATORY GUT DISEASES



3. BIRCH TREE

- THE BIRCH TREE IS NATIVE TO REGIONS OF AMERICA, EUROPE AND ASIA
- A TREE OF MANY USES, ITS WOODS CAN BE USED FOR FURNITURE MAKING, ITS LEAVES CAN BE BREWED INTO TEA AND ITS BARK CAN BE USED FOR PAIN RELIEF
- THE BARK OF THE BIRCH TREE IS RICH IN THE COMPOUND KNOWN AS BETULIN WHICH INHIBITS THE INFLAMMATION PROCESS THROUGH THE STAT-3 PATHWAY AND SUPPRESSING NF-KB PRODUCTION



Making Penicillin

.You will need : slice of bread or citrus peel, 750ml Erlenmeyer flask, media (see Step 4), 1000ml (1 L) graduated cylinder, and several clean milk bottles

.Prepare a penicillium culture. Expose a slice of bread or a citrus peel to a 70° F environment. A blue-green mold should develop

.Sterilize equipment: in oven at 315° Fahrenheit for 1 hour, or pressure cooker for at least 15 minutes. Wash milk bottles

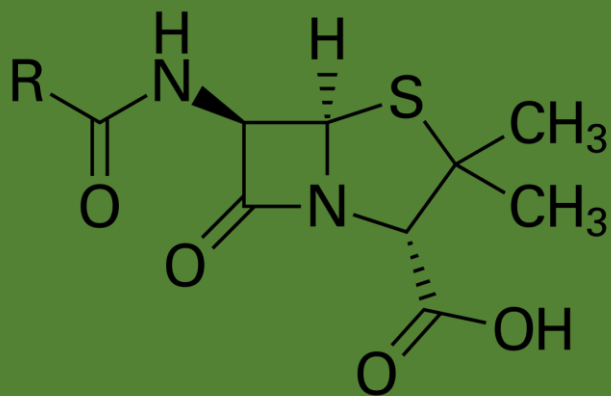
.Fill the Erlenmeyer flask. Cut the bread or citrus peel into small pieces and fill the flask. Allow to incubate in the dark at 70° F for 5 days. After incubation, can be stored in the refrigerator for no more than 10-14 days.

.Prepare the media. Dissolve in order listed, into 500ml of cold tap water: 44.0 grams Lactose Monohydrate, 25.0 grams cornstarch, 3.0 grams sodium nitrate, 0.25 grams magnesium sulfate, 0.50 grams potassium phosphate mono, 2.75 grams glucose monohydrate, 0.044 grams zinc sulfate, 0.044 grams manganese sulfate. Add enough cold tap water to make one liter. Use hydrochloric acid to adjust the pH to between 5.0 and 5.5.

.Fill the bottles with media. Use only enough so that when the bottle is placed in its side, the media does not reach the plug.

.Adding the penicillin spores. First sterilize the bottles of media in a pressure cooker or in the stove. When cooled, add 1 Tbsp of the spores.

.Incubate the bottles undisturbed on their sides at 70° F for 7 days. If the culture has worked to produce penicillin, it will be in the liquid portion of the media following this incubation period. Filter the media and refrigerate immediately. If you must use it, and you have no choice, use as soon as possible. Start with one tablespoon and go up if needed. The body will not absorb very much of the antibiotic so drink down repeated doses every hour to two hours

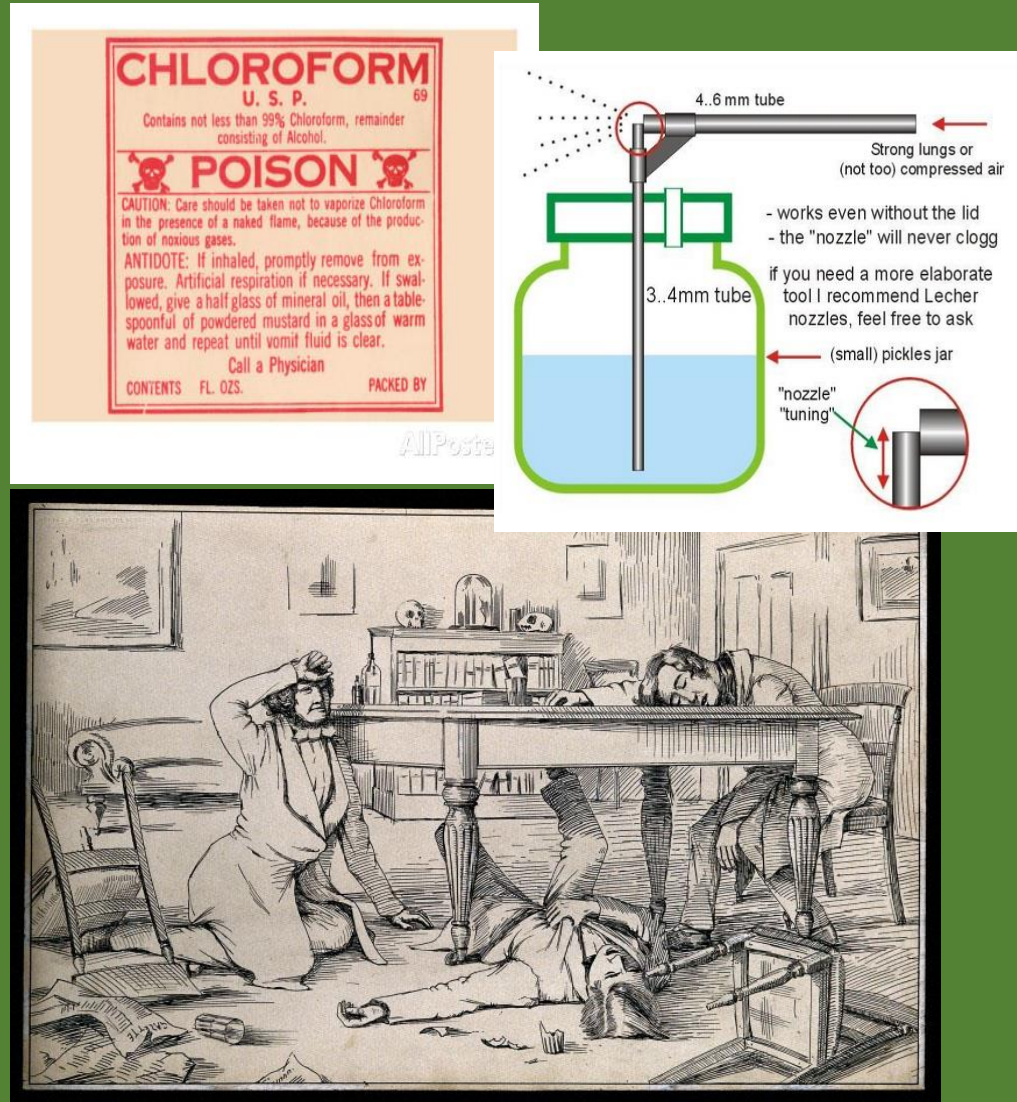


Chloroform

•Chloroform is a dangerous chemical used as an anesthetic in the old days; hospitals use better and safer anesthetics today

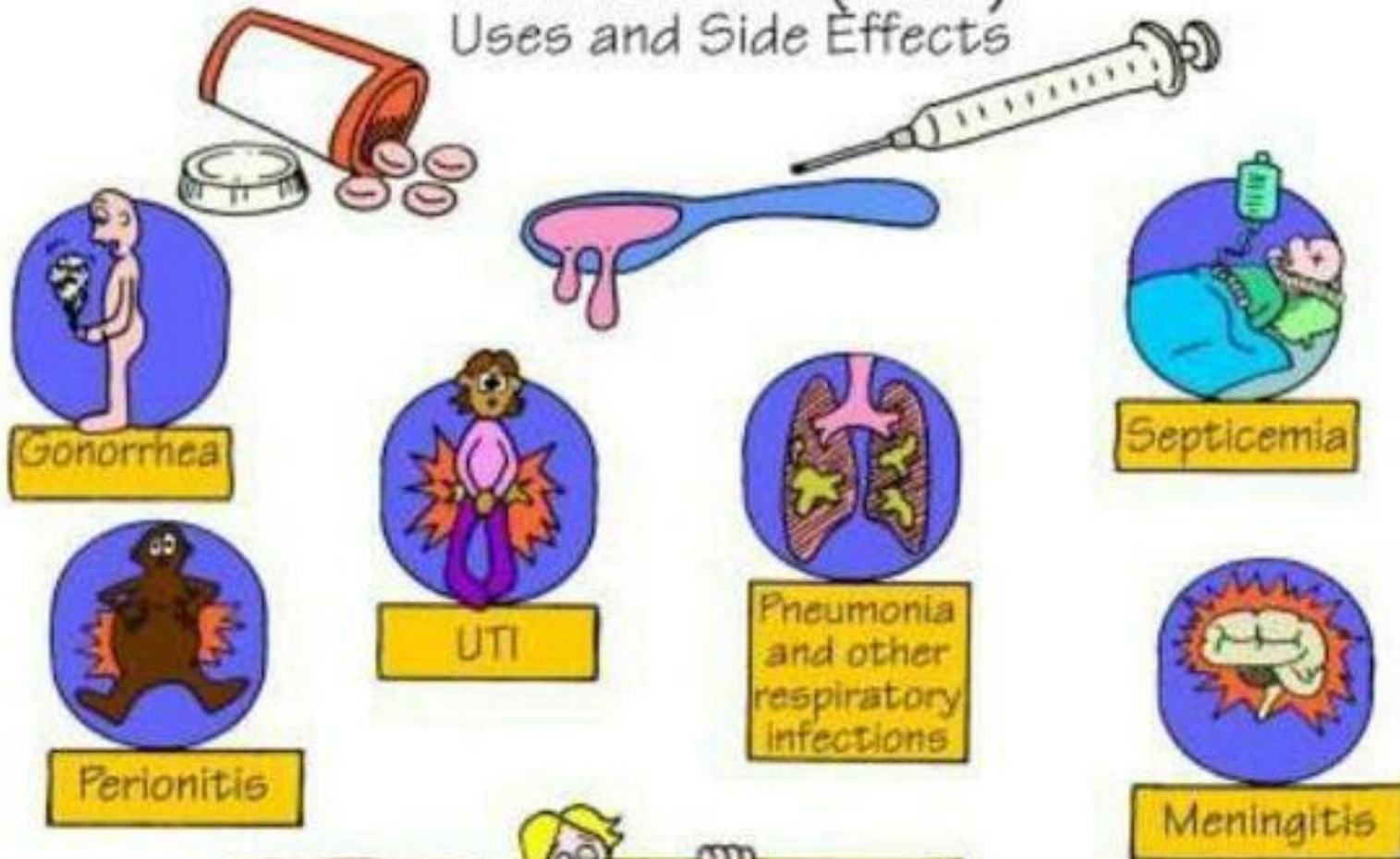
•To make Chloroform: mix equal parts ethanol with bleach (sodium hydrochloride) in a bottle and slowly heat, but don't boil; if smelling a sweet scent, quickly cover and allow to cool – and back away quickly

•Do not make or use unless in an emergency for minor surgery or assist in setting broken bones; and when administering, use an atomizer to control dosage – never a soaked cloth!



PENICILLIN (PCN)

Uses and Side Effects



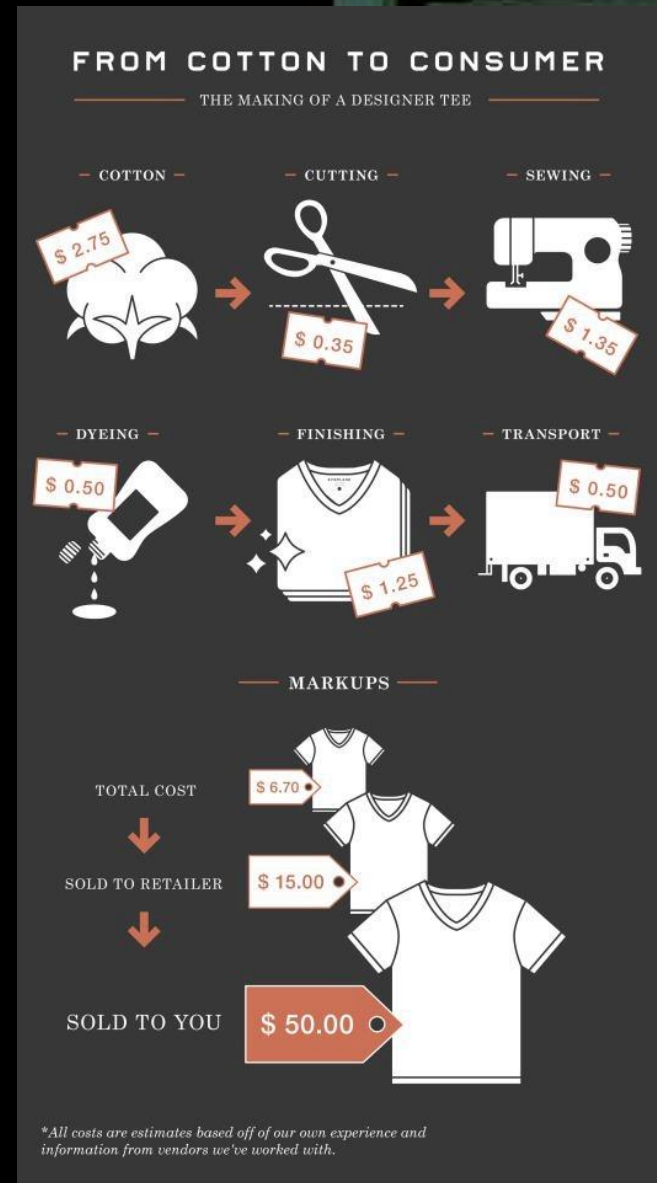
Penicillin works as a bacteriostatic or bactericidal. It can have these adverse reactions...

- GI Distress
- Oral/Vaginal Candidiasis
- Generalized Rash
- Anaphylaxis

I feel itchy already.

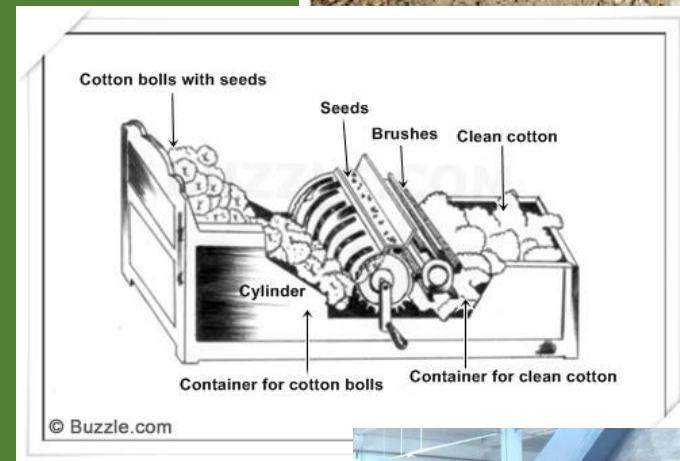
Textiles

- Fifty years ago, the average person had a small wardrobe of 4-5 sets of clothes; with the development of synthetic fibers and international trade that number has jumped 3000%
- In leaner times we may need to make our clothes again with locally grown fibers; this is a relatively simple but time consuming process requiring a lot of equipment; if we get to the point where we must make our own clothes, having your family spend winter months processing and manufacturing clothes would be optimal



Processing Cotton

- Cotton is the quickest and easiest to process if most of the work is done on small machines; cotton's an annual - pick when the plant dies and dries
- Best to use a cotton gin to separate the seeds from the fibers as it's far too time consuming doing this by hand
- After separating the fibers it's time to wash and card the harvest; washing is done by gently simmering in soapy water for 10-20 minutes, rinse and air dry; for carding - use either hand cards for this process or a bench crank machine similar to the gin; cuts down processing time by at least 80%
- Wash the cotton in soapy, simmering water between 10-30 minutes depending on quantity and then rinse in cold water; dry, comb out any debris and card in preparation for spinning



Basic Cotton Gin

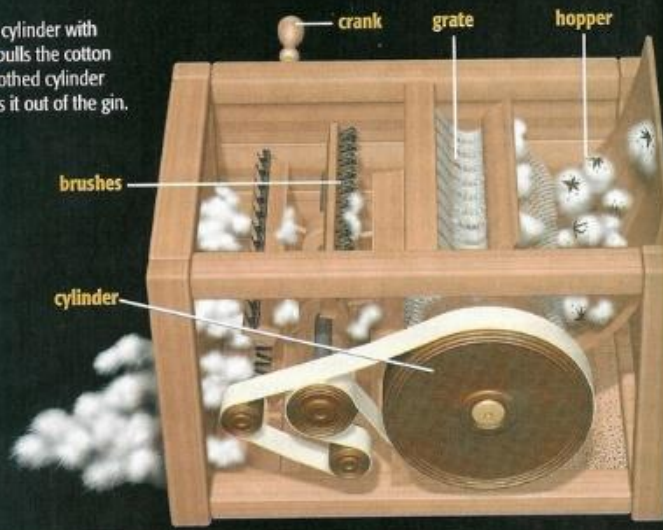


1 Cotton bolls are dumped into the **hopper**.

2 A **crank** turns the **cylinder** with wire teeth. The teeth pull the cotton past a **grate**.

3 Slots in the **grate** allow the cotton, but not its seeds, to pass through.

4 A second cylinder with **brushes** pulls the cotton off the toothed cylinder and sends it out of the gin.



Processing Wool

- Our location is not suitable for raising sheep but we are zoned for raising angora rabbits - processing is the same except if the rabbits are kept in hutches there'll be less waste
- Wool is more laborious than cotton as the extra steps done on traditional tools and equipment are single action – if there's a way to combine steps with machinery then use it
- Commercial Angora farms strap the rabbit to a rack by it's four feet in a prostration position to quickly clip the wool, but one can train rabbits to relax during collection; begin at the back with a set of shearing clippers or an electric shearer, and work your way forward; the rabbit will need to grow accustomed to this, and will overtime; leave most of the paws, face, tail, and ears unsheared
- Wash wool in soapy, simmering water for 10-30 minutes depending on quantity; rinse and then comb out any debris and card for spinning





SHEEP



SHEARS



WASH



COMB (WORSTED)



CARD (WOOLEN)



NAPPING



CLOTH



WOOL WHEEL (GREAT WHEEL)



REEL



QUILL WINDER



SWIFT



SCARNE



WARPING FRAME



SHUTTLE



LOOM

WARP
THREAD

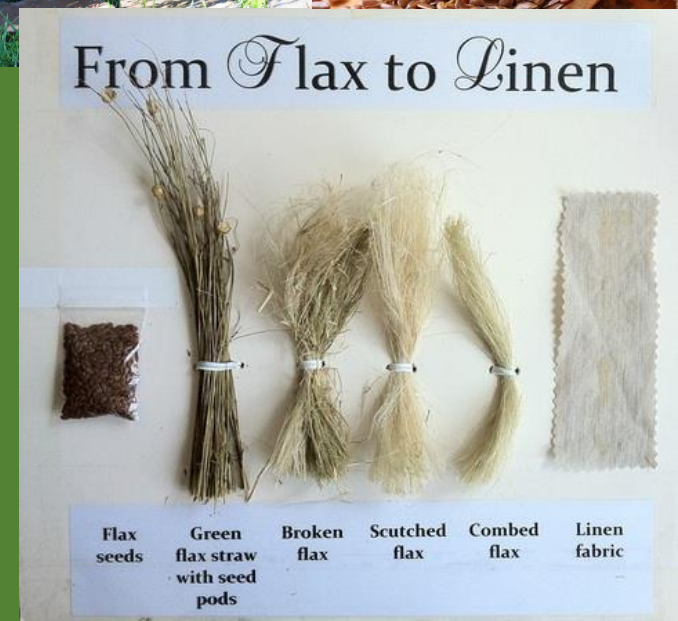
WEFT
THREAD

WASH
AND/OR
DYE

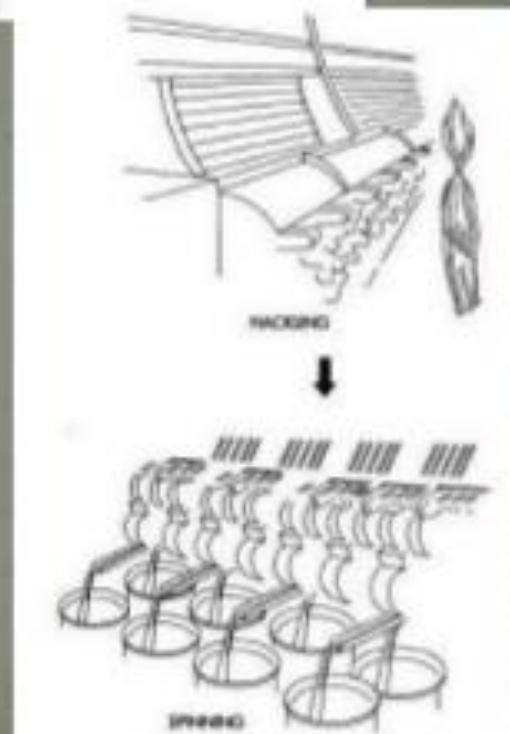
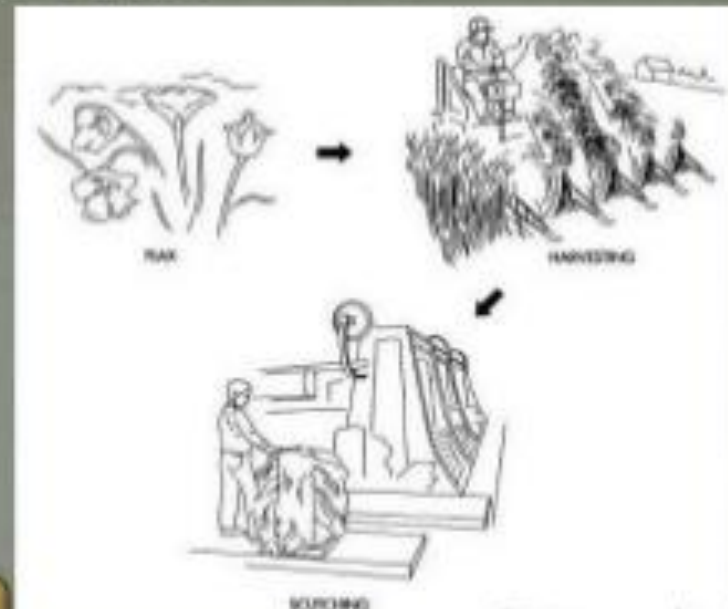
COULD BE
DYED NOW

Processing Flax (Linen)

- Flax grows in long, thin stems with high tensile strength; used for everything from fine fabric to canvas and heavy duty cord
- An old homesteading schedule had amateur farmers grow flax every fourth year instead of grass to rest the fields
- Harvest by pulling up the plant, roots and all, and let the plant dry in the sun; some farmers say cut off the roots before drying, others say to wait until processing
- Be sure to have all equipment ready beforehand: A thick comb for removing the leaves and seed heads (keep seeds for next year's crop, eating, or extracting oil), a bucket or small tank of water for soaking the dried stems for 4-6 days to encourage fiber swelling and bacterial growth to weaken the outer stalks (change water after the first 8 hours); followed by using a combination breaker and hackling comb or breaking off the outer stems and brushing out the fibers and removing the "tow"



LINEN MANUFACTURING PROCESS



Unwinding and Spooling Silk

- Four to six days after spinning a cocoon, they are ready for processing
- Silk cocoons are held together with a gum resin secreted by the worm; it's easily removed by soaking the cocoons in hot, soapy water
- Find the end of the thread – it's not a quick task so be patient; use between 35-800 cocoons (depending on desired thickness) still in a bath of simmering soapy water to spin into your thread; funnel all of the silk from the cocoons through a single hole, and then wind onto a large spool
- After spinning, the silk can be dyed and wound onto smaller spools for ease of use



Washing, Brushing, and Carding Fibers

- Cotton and wool needs this step; flax and silk have different requirements
- Wash in soapy, simmering water to loosen the fibers and lift off fine dirt particles; when doing this step for wool there is a very strong odor, this is the lanolin and other chemicals in the wool coming out, so don't keep in the water too long or the wool will be very irritating to sensitive skin; however, keep the water and reduce to a gel for a sensitive skin soap; rinse in clean water for the next step
- Comb out any large debris; now use either hand cards or a carding machine to separate and straighten the fibers in preparation for spinning
- Carding is very labor intensive and a simple machine made of carding mats (available online around \$22 each or push long staples through canvas and glue in place) and built similar to a cotton gin will reduce time significantly



Spinning Threads

- Next step is spin the fluff into thread
- Spinning yarn with a spindle: a straight stick eight to twelve inches long on which the yarn is wound after twisting; has a hook on the top in which the thread was fixed; the bunch of wool or plant fibers is held in the left hand, with the right hand the fibers are drawn out several inches and the end fastened securely in the slit or hook on the top of the spindle; whirling motion is given to the spindle on the thigh or any convenient part of the body; the twisted yarn is then wound on to the upper part of the spindle then another bunch of fibers is drawn out, the spindle is given another twirl, the yarn is wound on the spindle, and so on h/t Textiles and Clothing
- Spinning wheels simplifies the process by providing the rotation; all you need to focus on is feeding into the machine and providing power
- Spinning threads of wool or cotton together creates yarn for knitting and crocheting



I play football and baseball, have worked as a builder and don't take guff from anybody. I also like to relax by spinning wool into yarn. Surprisingly enough, it's an easy hobby to get started in. The Penguin Wheel (so named because it resembles the familiar, web-footed bird) is a clever quill-type design that's fairly simple to learn on. Compared to the price of most ready-made wheels (\$200 and up), the Penguin is inexpensive to build. Materials will cost about \$70 if you mail-order both the plywood and hardware kit. (See sup-

by Joseph R. Provey
ASSISTANT HOME AND SHOP EDITOR

DETAIL PART C, TOP VIEW

3"

1-7/8"

3/8" DIA. HOLE, 5/8" DEEP (2 PLACES)

3/4"

6"

4-1/2"

10-7/2"

14-5/8"

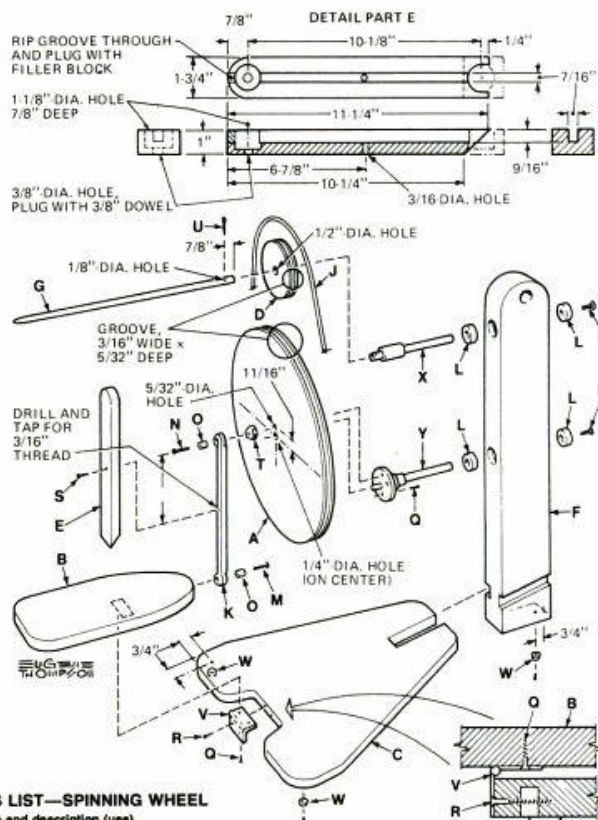
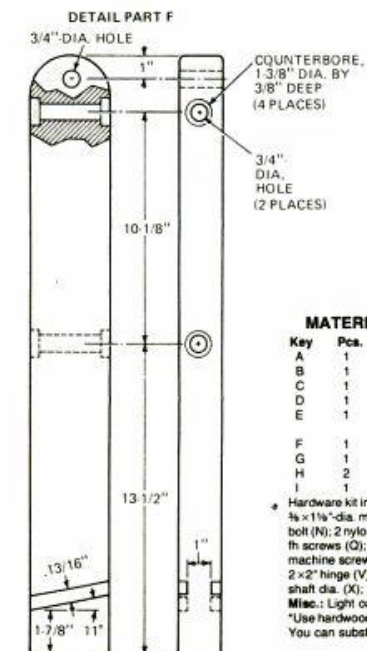
11"

DRILL 7/16" DIA. HOLE TO FORM INSIDE CURVE 1-1/4" RADIUS

1-1/4" RADIUS

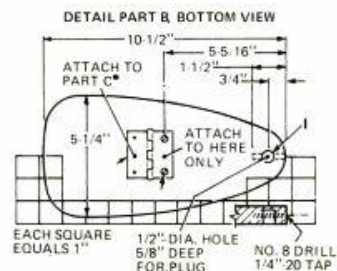
3-5/8"

PILOT HOLE FOR HINGE SCREW (2 PLACES)



Key	Pcs.	Size and description (use)
A	1	$1\frac{1}{2}$ " x $14\frac{1}{2}$ " dia. plywood* (large wheel)
B	1	$1\frac{1}{2}$ " x $5\frac{1}{2}$ " x $10\frac{1}{2}$ " plywood* (traverse)
C	1	$1\frac{1}{2}$ " x $10\frac{1}{2}$ " x $14\frac{1}{2}$ " plywood* (base)
D	1	$1\frac{1}{2}$ " x $4\frac{1}{2}$ " dia. solid maple* (small wheel)
E	1	$1\frac{1}{2}$ " x $1\frac{1}{2}$ " x $12\frac{1}{2}$ " solid maple* (footman cover); * rip and plane to size
F	1	$1\frac{1}{2}$ " x $3\frac{1}{2}$ " x $26\frac{1}{2}$ " solid maple* (upright)
G	1	$\frac{3}{4}$ " dia. x $11\frac{1}{2}$ " dowel; taper one end (quill)
H	2	$\frac{3}{4}$ " dia. x $\frac{1}{2}$ " maple plug
I	1	$\frac{1}{2}$ " dia. x $\frac{1}{2}$ " maple plug

Hardware kit includes 51* tubular bolt (J); metal footman (K); 4 $\frac{1}{2}$ " x $1\frac{1}{2}$ " dia. metal bearings (L); $\frac{1}{2}$ " x $11\frac{1}{2}$ " rib bolt (M); $\frac{1}{2}$ " x $2\frac{1}{2}$ " rib bolt (N); 2 nylon bushings (O); 2 $\frac{1}{2}$ " dia. x $\frac{1}{2}$ " rib bolts (P); 5 $\frac{1}{2}$ " x screws (Q); 2 $1\frac{1}{2}$ " x screws (R); $\frac{1}{2}$ " dia. x $\frac{1}{2}$ " oval-head machine screw (S); 2 acorn nut spacers (T); brass cotter pin (U); 2 $\frac{1}{2}$ " x $1\frac{1}{2}$ " x $1\frac{1}{2}$ " screws (V); 1 $\frac{1}{2}$ " x $1\frac{1}{2}$ " x $1\frac{1}{2}$ " screw (W); 1 $\frac{1}{2}$ " x $1\frac{1}{2}$ " x $1\frac{1}{2}$ " screw (X); lower axle, $\frac{1}{2}$ " shaft dia. (Y).
Finish: Light oak stain, polyurethane varnish, white glue.
 *Use hardwood (maple or birch) veneer, lumber-core plywood.
 You can substitute clear one for solid maple stock.



Dyeing

- Dyeing works in either the thread stage or with the final product; in this primer we'll focus on dyeing in the thread stage
- Start by bleaching the threads (not in a washing machine), dry, and then dye in the solution for however long is necessary, rinse, and lastly air dry
- Commercial dyes tend to work better than homemade ones and last longer; in a pinch or to use up waste, plants and kitchen scraps will yield their hues: For fruit dyes, simmer your fabric in four cups of water and 1/4 cup salt. If you're using vegetable dyes, simmer in four cups of water and one cup of vinegar. Then boil for one hour. Once you're done boiling, rinse the fabric in cold water. Finally, let it soak in the natural dye until it gets to the desired shade. h/t earthfriendlytips.com



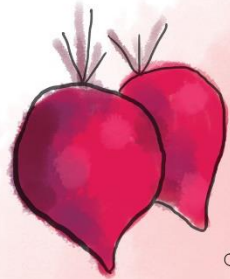
Directions for Making Natural Dyes

1. Gather the fruit or vegetable scraps you're using to make your homemade natural dyes. You'll need about one cup of chopped scraps to make each color.
2. Add your chopped scraps to [a small saucepan](#) and cover with twice as much water. Simmer the scraps over medium heat for one hour.
3. Turn off the heat, and let the water cool down to room temperature.
4. Strain the dyed water into [a glass container](#). You now have natural dyes ready to go.
5. If you want to dye fabric, you need to start by placing it in a fixative. For fruit dyes, simmer your fabric in four cups of water and 1/4 cup [salt](#). If you're using vegetable dyes, simmer in four cups of water and one cup of [vinegar](#). Then boil for one hour. Once you're done boiling, rinse the fabric in cold water. Finally, let it soak in the natural dye until it gets to the desired shade.

D.I.Y. Natural Fabric Dyes

*Design*Sponge*

Add **1 part** chopped ingredient to **2 parts** water in a pot. Bring to a boil, simmer for one hour. While dye is simmering, add **1 part** vinegar and **4 parts** water to a pot. Bring to a boil, add desired fabric and simmer for one hour. Rinse fabric in clear cool water and your fabric is ready to be dipped into the (strained) dye! Leave fabric in dye until desired color is reached, then hang to dry. (Allow fabric to soak overnight for deeper color).



Reds & Pinks

Beets, Blueberries, Strawberries, Cherries, Raspberries, Hibiscus Flowers



Blues & Purples

Purple cabbage, Blackberries, Grapes, Purple Iris



Green

Artichokes, spinach, nettle



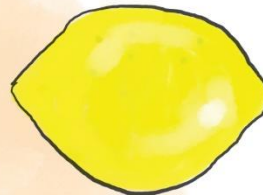
Orange

Yellow onion skin/peel and Carrots



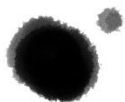
Yellow

Lemon and orange peels



Grey & Black

Sumac leaves, Meadowsweet and Walnut Hulls



Brown

Acorns (boiled), coffee grinds, walnut hulls



1 WASH WOOL IN LUKEWARM WATER AND NATURAL DISH DETERGENT. RINSE IN COOL WATER UNTIL THE WATER RUNS CLEAR. THIS STEP, CALLED "SCOURING" REMOVES THE NATURAL LANOLIN THAT WOULD OTHERWISE INTERFERE WITH THE FIBER ABSORBING DYE. SOAK SCOURED WOOL IN COOL WATER OVERNIGHT.

2 WEARING RUBBER GLOVES. COMBINE THE ALUM AND CREAM OF TARTAR IN A HEAT PROOF JAR. ADD A BIT OF BOILING WATER AND STIR UNTIL DISSOLVED.

3 ADD THE MIXTURE TO A STAINLESS STEEL POT. FILL WITH ENOUGH COOL WATER FOR FABRIC TO MOVE FREELY.

4 ADD THE SOAKED FABRIC TO THE POT, TURN HEAT TO LOW, AND BRING TO A VERY GENTLE SIMMER FOR ONE HOUR (KEEP TEMPERATURE RIGHT AROUND 180°F/82°C)

5 REMOVE THE POT FROM HEAT. LET COOL. THEN RINSE THE FIBER IN WATER THE SAME TEMPERATURE (I.E. IF YOU COOL IT OVERNIGHT RINSE IT IN COOL WATER; IF YOU COOL IT FOR AROUND AN HOUR, RINSE IT IN LUKEWARM WATER) UNTIL WATER RUNS CLEAR.



6 PUT ONION SKINS IN THE DYE POT AND COVER WITH ENOUGH WATER FOR THE FABRIC TO FLOW FREELY ONCE ADDED. BRING TO A BOIL, THEN SIMMER 15-20 MINUTES, UNTIL THE COLOR HAS LARGELY LEACHED FROM THE SKINS INTO THE WATER.

7 USE A SLOTTED SPOON OR FINE MESH SIEVE TO SCOOP OUT THE ONION SKINS. ADD THE WET, MORDANTED FIBER TO THE POT. SIMMER AT LEAST 10 MINUTES, OR UNTIL YOU ACHIEVE YOUR DESIRED COLOR, EVEN OVERNIGHT (A LONGER SOAK TIME RESULTS IN DARKER COLOR).

8 LET THE POT COOL COMPLETELY. REMOVE THE FABRIC AND WASH IT IN COOL WATER WITH A MILD LIQUID SOAP. RINSE VERY GENTLY AND HANG TO DRY.



Dyers Woad

- Introduced by Brigham Young for producing ink; lacking natural predators, Dyers Woad is now considered an invasive species
- Grows wild; no need to grow in your own gardens – Utah USDA/NRCS has paid for pulled Woad in the past as means to control the plants
- To process into dye/ink: chop the leaves coarsely and grind in a mortar & pestle until sap is released; squeeze by hand into balls and leave to dry, store and use when needed
- For dyeing; crush the balls in the mortar and pestle into a fine powder – delude in water, ammonia, and powdered lime; gently dip threads or cloth into the solution to avoid adding too much oxygen to the vat and leave for several seconds (the longer left in, the darker the blue color), when taken out, the dye will react with the oxygen in the air and turn blue
- For ink; grind into a powder and expose to oxygen, add veg oil when ready to use



Weaving Cloth

- Weaving is really two major processes; the actual weaving followed by felting
- Load the shuttle spool with thread either by hand or faster with a spinning wheel; automatic looms do not use shuttles – they use two mechanical grips to pass the thread between them
- Any size loom will work; from basic table top and vertical looms to large mechanical looms with automatic shuttles; have some means to tamp the weave down and keep it tight but not too tight that it bunches up the cloth
- After making a bolt of cloth comes felting – crushing the cloth so the fibers mesh together better; place a single layer of cloth in a shallow pool of water and use a blunt object to pound the fibers together; 3-5 times for basic homespun up to 50-60 times for solid cloth
- The thinner the thread the tighter the weave must be



Travis Joseph Meinolf's Collapsible Four-harness Floor Loom 2010
for more developments and how to set up the loom and what tools you will need to set up your studio, visit actionweaver.com

Framing Timbers = 24 x 48 mm

6 @ 115 cm
6 @ 1m
8 @ 85 cm
2 @ 75 cm
2 @ 60 cm
9 @ 10 cm
2 @ 5 cm

Pedals = 16 x 34 mm
6 @ 75 cm

Lams = 10 x 18 mm
6 @ 85 cm

Dowels = 35 mm
1 @ 95
2 @ 75

Dowels = 10 mm
10 @ 90cm

HARDWARE

nut/bolts
30 @ 6,0 x 60 mm
2 @ 6,0 x 90 mm



50 6,0 washers
12 6,0 nuts
2 6,0 wingnuts
20 4,0 x 40 mm screws
2 4,0 x 80 mm screws
6 clip hooks
4 small S-hooks

6,0 threaded rod
3 @ 95 cm

lots of strong twine
5 m cotton webbing
15 cm velcro
wood glue

TOOLS

drill
3, 4 and 6mm drill bits
10 mm crescent wrench
saw
screwdriver

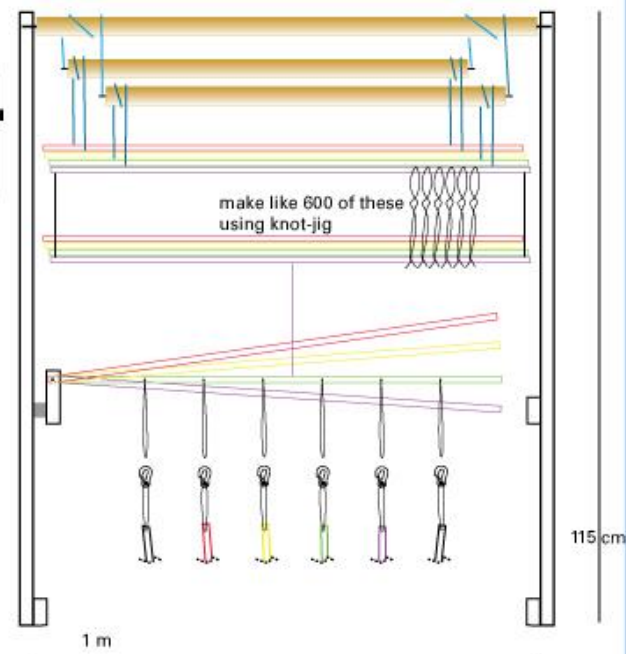
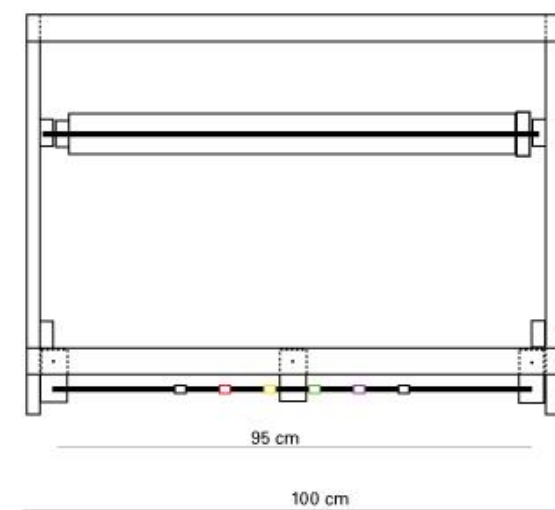
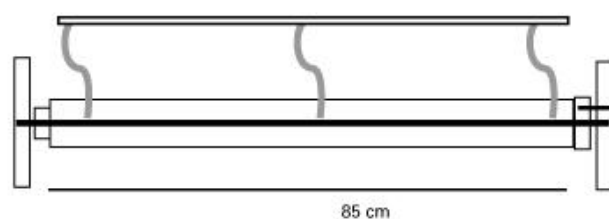
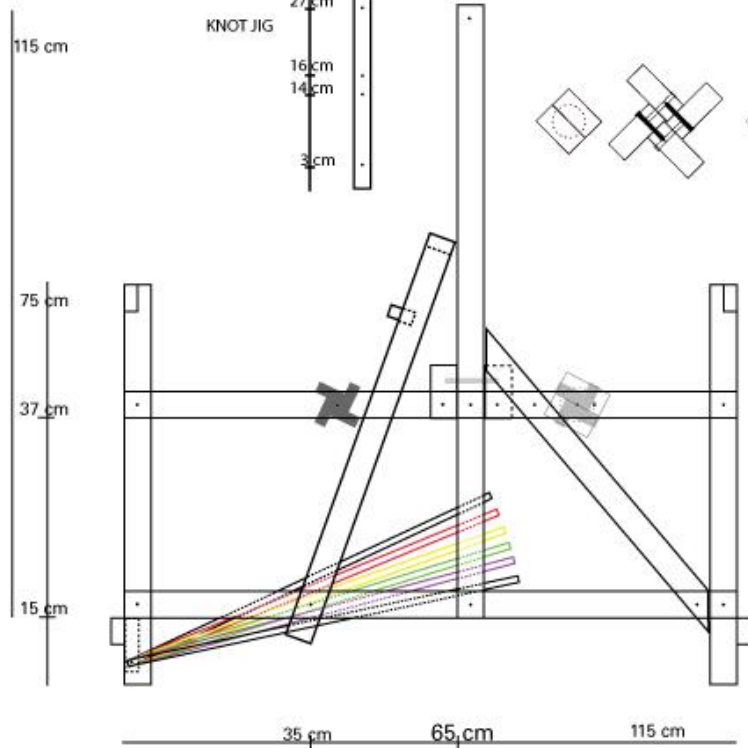
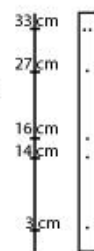


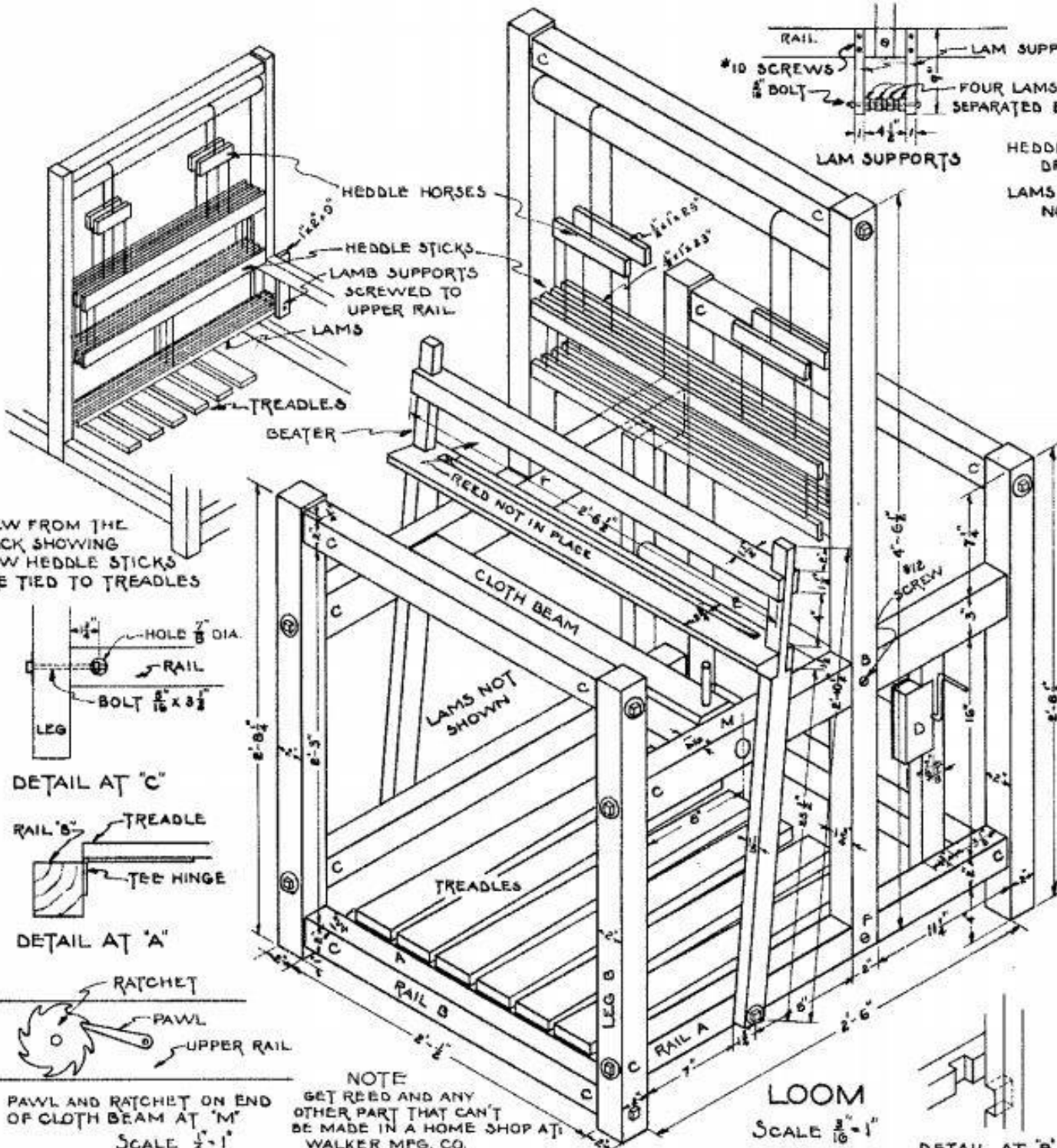
BEATER

you must find a reed and affix it in here.

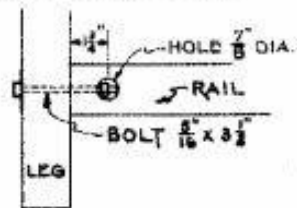
Also make one Warping Board
to measure your yarn
4 more framing timbers,
2 @ 90 cm, 2 @ 60
and 10 mm dowels,
15 @ 15 cm

KNOT JIG

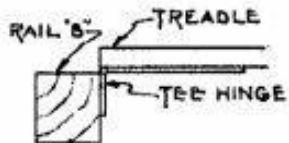




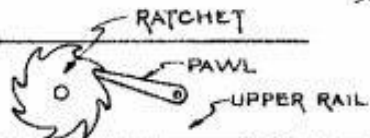
VIEW FROM THE BACK SHOWING HOW HEDDLE STICKS ARE TIED TO TREADLES



DETAIL AT "C"



DETAIL AT "A"



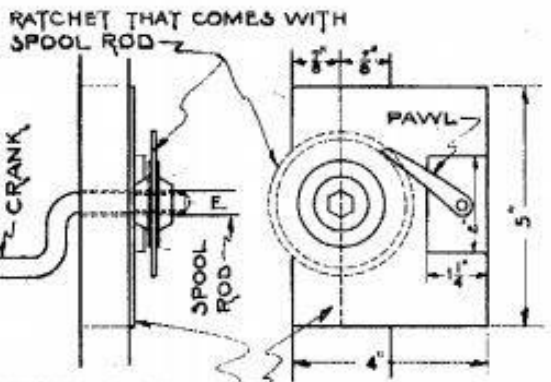
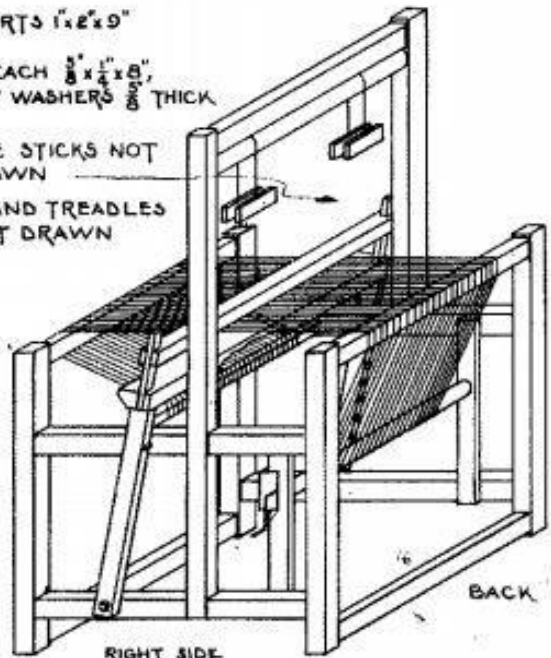
PAWL AND RATCHET ON END OF CLOTH BEAM AT "M" SCALE 1/2"=1"

NOTE
GET REED AND ANY OTHER PART THAT CAN'T BE MADE IN A HOME SHOP AT:
WALKER MFG. CO.
ATLANTIC AND RUTH STS. PHILADELPHIA PA.

LOOM
SCALE 3/16"=1"

DETAIL AT "B"

DETAIL AT "F"



DETAIL AT "D"
SCALE 1/2"=1"

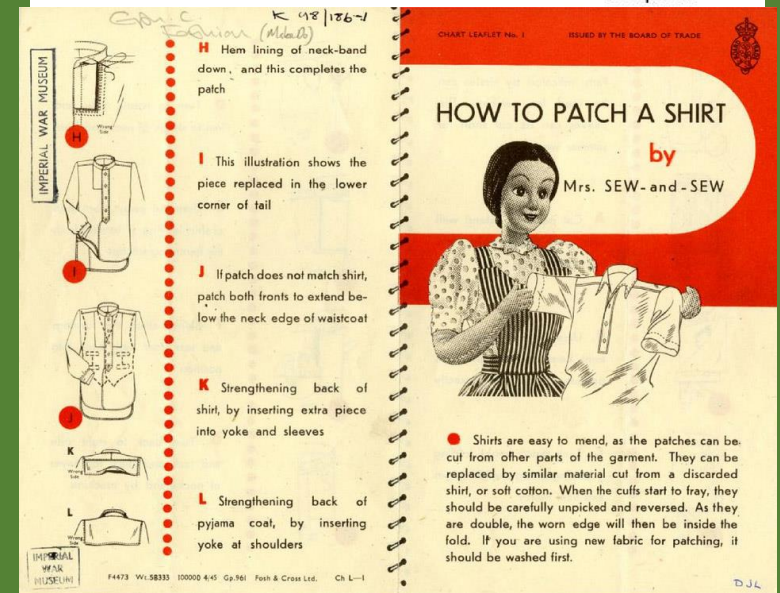
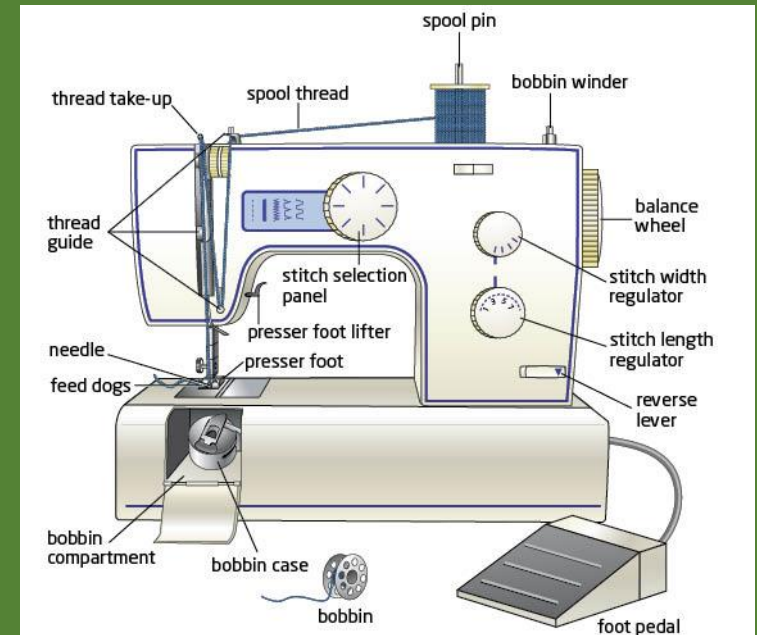
COOPERATIVE EXTENSION WORK IN
AGRICULTURE AND HOME ECONOMICS
STATE OF NORTH DAKOTA
NORTH DAKOTA AGRICULTURAL COLLEGE
AND
U. S. DEPT. OF AGRICULTURE COOPERATING
EXT. AGR. ENGINEER-FARGO, N. DAK.

LOOM

PLAN NO. N.D. 380-1-1 DRAWN BY J. B. GATE 1935

Sewing

- In the early years of WWII up to the mid 1950's clothing was rationed with ration books and the Make Do and Mend program starring Mrs. Sew and Sew; the idea was to repurpose, redesign, and patch up existing clothing instead of purchasing; both men and women had sewing meetings where friends, neighbors, and coworkers would pool scraps and old clothes and make repairs together
- Basic hand stitches moves quickly with practice, however a good sewing machine pays for itself; follow sewing patterns and keep your machine clean and oiled
- Try embroidery at least once; Utah Pioneers had a scarlet embroidery trend for decades – single color bright red stitching on a bleached white background



HAND SEWING

SUPPLIES:



RUNNING STITCH

Used as a decorative stitch or for seams. Stitch is easy but also not very strong. Stitches should be small & even.



BASTING STITCH

Big running stitch to loosely hold together fabric for more detailed stitching and to mark stitching lines on both sides of fabric. Ends are not knotted, for easy removal.



BACK STITCH

Strong hand stitch for holding seams together and inserting zippers by hand. Stitches overlap on the back.

Back

Front

Used to attach a folded edge to another fabric invisibly. Uses a single thread. Keep stitches small and neat.

SLIP STITCH

BLANKET STITCH

Good stitch for finishing edges. Stab from bottom up, and wrap thread around half exposed needle in the direction you are sewing.

BUTTON HOLE STITCH

Similar to a blanket stitch, but knots after each stitch. Wrap around the needle in the opposite direction to knot.



BUTTON SHANKS

Buttons going through thick fabrics need shanks.



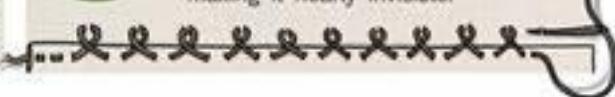
FELL STITCH

This stitch is used for attaching applique and stitching down facings. Stitches should be almost invisible.



CATCH/HEMMING STITCH

Used mostly for hemming, this stitch takes a couple threads from the front of the fabric in each "X", making it nearly invisible.

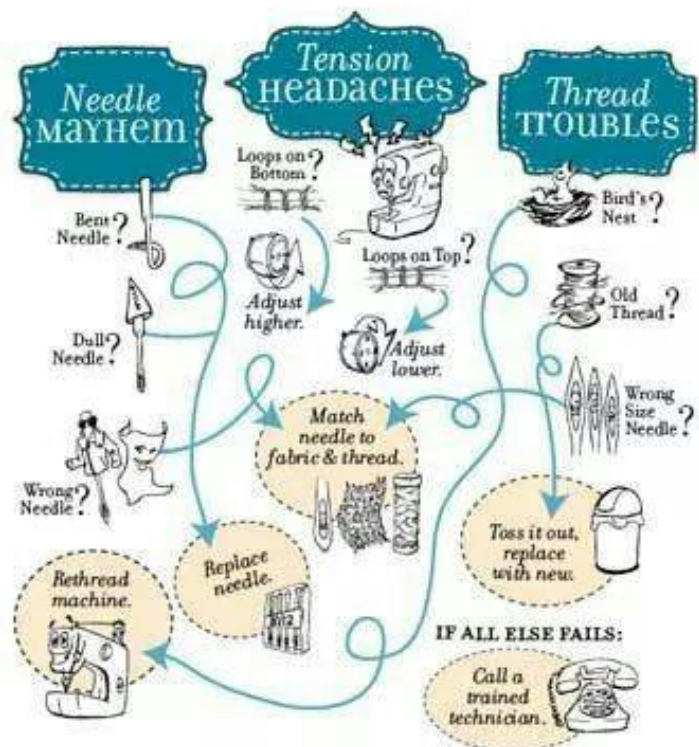


SNAPS & NOTIONS

Snaps & Notions should be sewn on with thick thread using the Button Hole Stitch.



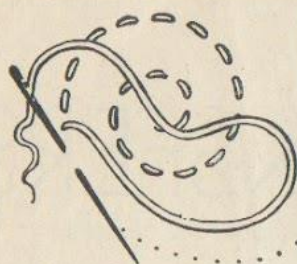
SEWING MACHINE TROUBLESHOOTING



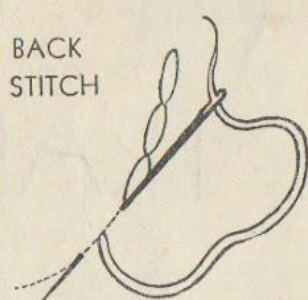
As seen in the Dec/Jan 2014 issue of Sew News: sewnews.com.
Illustration by Dustin Resch: dustinresch.com.

EMBROIDERY STITCHES

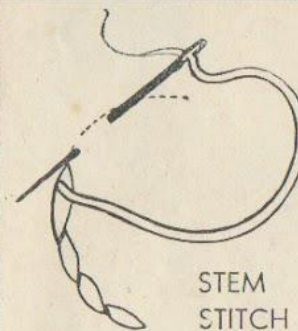
for your
FREE TRANSFERS



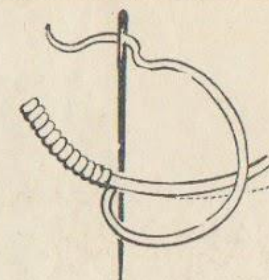
RUNNING STITCH



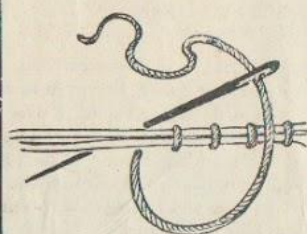
BACK
STITCH



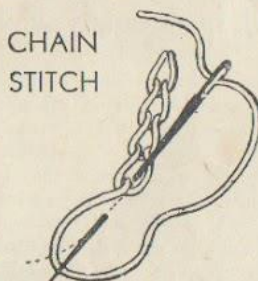
STEM
STITCH



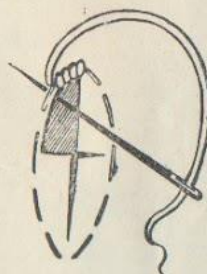
OVERCAST STITCH



COUCHING



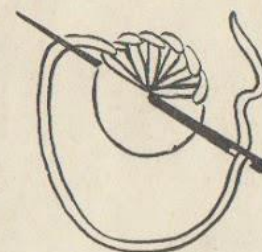
CHAIN
STITCH



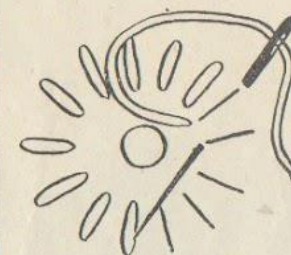
EYELET HOLE



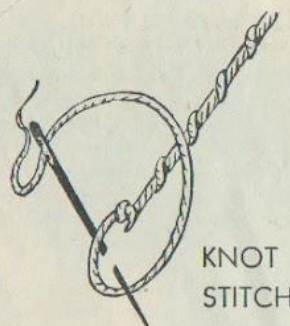
LINK STITCH



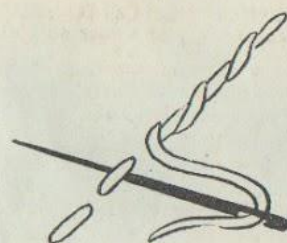
BUTTONHOLE STITCH



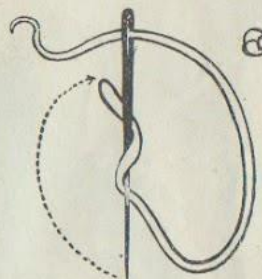
STRAIGHT STITCH



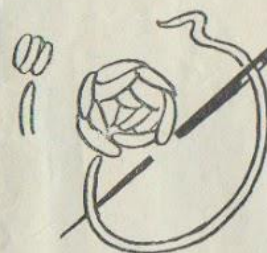
KNOT
STITCH



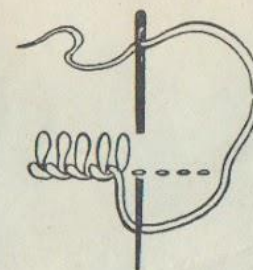
RUN OR WHIP STITCH



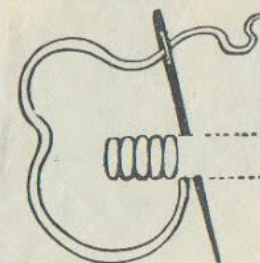
FRENCH KNOT



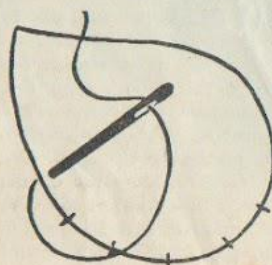
RAISED ROSE STITCH



BUTTONHOLE STITCH



SATIN STITCH



APPLIQUÉ



APPLIQUÉ 2.

WELDON'S EMBROIDERY STITCHES

PRACTICAL NEEDLEWORK No. 12

PRICE 4d., BY POST 4½d.

gives full directions for working over 70 stitches.


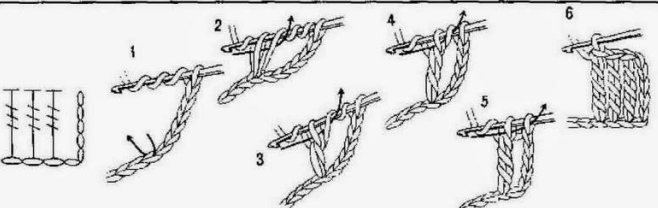

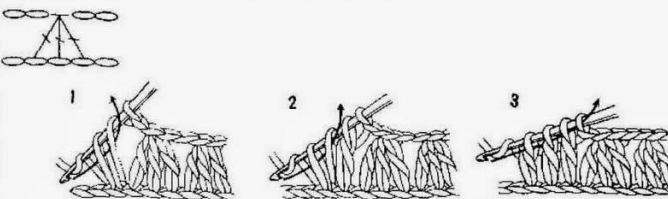

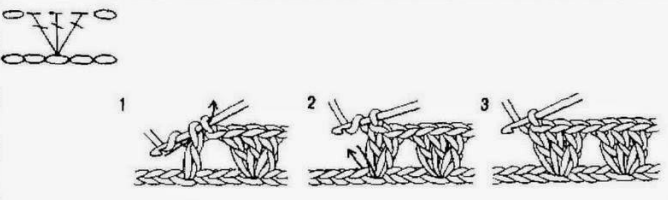

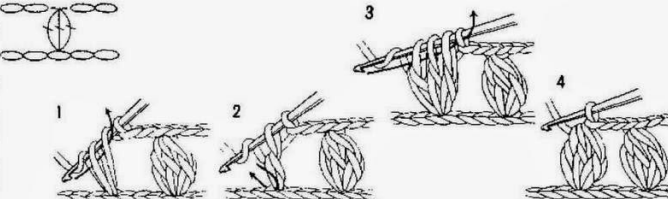

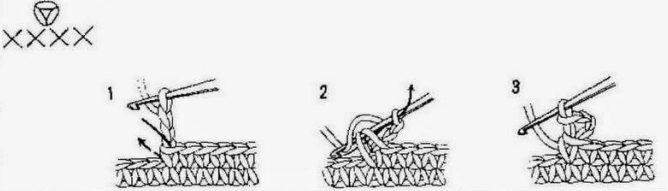

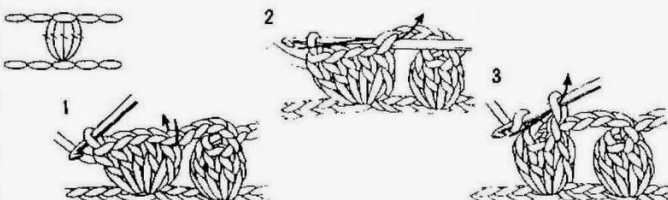
When pressing off Transfers on to materials having a harsh or hairy surface, it is advisable to put a damp muslin over the back of the transfer, press quickly with a hot iron and remove muslin and transfer at once.



LAZY
DAISY



SINGLE STITCHES

 Quadruple or double treble crochet (dtr)	
 3-double-crochet cluster (3-dc cluster) * 3 treble cluster (3tr cls)	
 3-double-crochet increase (3-dc inc.) * 3 treble increase (3 tr incr)	
 3-double-crochet puff (3-dc puff) * 3 treble puff (3tr puff)	
 3-chain picot (3-ch picot)	
 5-double-crochet popcorn (5-dc popcorn) * 5 treble popcorn (5 tr popcorn)	


* British terminology

63

FREE CROCHET STITCH QUICK GUIDE FOR BEGINNERS

Crochet Beginner Stitch Quick Guide

These basic stitches are most common and can be combined to make more advanced stitches.

Stitch Symbol	Stitch Name (Abbreviation)	Steps to Complete Stitch
	Chain (CH)	Yarn over (YO). Pull hook through loop just created by YO.
	Slip Stitch (Sl St or SS)	Insert hook into stitch. Yarn over (YO). Pull up a loop through the stitch.
	Single Crochet (SC)	Insert hook into stitch. Yarn over (YO). Pull up a loop through stitch. Yarn over (YO). Pull through both loops on hook.
	Half Double Crochet (HDC)	YO. Insert hook into stitch. YO. Pull up a loop. YO. Pull through all 3 loops on hook.
	Double Crochet (DC)	YO. Insert hook into stitch. YO. Pull up a loop. YO. Pull through 2 loops on hook. YO. Pull through last 2 loops on hook.
	Treble Crochet (TC)	Yarn over twice. Insert hook into stitch. YO and pull up a loop. YO. Pull through 2 loops. YO. Pull through 2 loops. YO. Pull through last 2 loops on hook.
	Double Treble Crochet (DTC)	Yarn over three times. Insert hook into stitch. YO and pull up a loop. YO. Pull through 2 loops. YO. Pull through 2 loops. YO. Pull through last 2 loops.

Beginner Terminology

Terms a beginner needs to know to read and understand a crochet pattern.

St - Abbreviation for Stitch

Repeat (rep)

Instructions surrounded by () or [] or ** are to be repeated the designated number of times.

Example: (SC in st. DC in next st.) Rep to end of row.

Fasten Off & Weave In

At the end of project: To fasten off, complete a chain at the end, cut the yarn and pull the tail all the way through the chain. Then use a yarn needle to sew in the tail so you can't see it.

Sp - Abbreviation for Space

Turning Chains

This term refers to the chains stitches completed at the beginning or end of a row accompanied with the instruction to turn your work. This is an instruction given when you are working back and forth on a project as opposed to in the round.

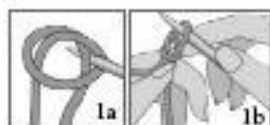


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Have a Ball!! (of yarn)

Click to Get A Printable Copy Delivered to your Inbox Now!

Casting On



1a Make a slip knot. Loop the yarn as shown and slip needle under the lower strand of the loop.

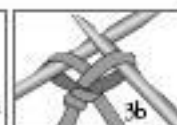
1b Pull up a loop of yarn.



2 Pull the yarn end attached to the ball of yarn to tighten the slip knot leaving the other end approx 4 ins [10 cm] long. Transfer needle to left hand.



3a Insert the right-hand needle through slip knot and wind yarn over right-hand needle.



3b Pull loop through slip knot.



4 Place new loop on left-hand needle. (You now have 2 stitches (sts) on your left-hand needle).

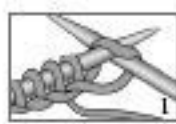


5 Insert right-hand needle between last 2 stitches (sts) on left-hand needle and wind yarn over right-hand needle.

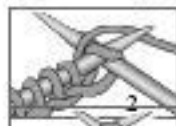


6 Pull loop through. Place this new loop on left-hand needle beside last stitch (st). (You now have 1 more stitch on left-hand needle). Repeat (rep) steps 5 and 6 until required number of stitches (sts) have been cast on left-hand needle.

The Knit Stitch



1 Hold the needle with cast on stitches (sts) in your left hand, and the loose yarn attached to the ball at the back of work. Insert right-hand needle from left to right through the front of the first stitch (st) on the left-hand needle.



2 Wind the yarn from left to right over the point of the right-hand needle.



3 Draw the yarn through this original stitch (st) which forms a new stitch (st) on right-hand needle.



4 Slip the original stitch (st) off the left-hand needle, keeping the new stitch (st) on the right-hand needle.



5 To knit a row, repeat steps 1 to 4 until all stitches (sts) have been transferred from left-hand needle to right-hand needle. Turn the work by transferring the needle with stitches (sts) into your left hand to knit the next row.

The Purl Stitch



1 With yarn at front of work, insert right-hand needle from right to left through front of first stitch (st) on left-hand needle.



2 Wind yarn around right-hand needle. Pull yarn through stitch (st).



3 Slip original stitch (st) off needle. Repeat (rep) these steps until all stitches (sts) on left-hand needle have been transferred onto right-hand needle to complete one row of purling.

Increasing and Decreasing



1 Increase 1 stitch (st) in next stitch (st). Work into front and back of stitch (st) as follows: Knit stitch (st), then before slipping it off needle, twist right-hand needle behind left-hand needle and knit again into back of loop. Slip original stitch (st) off needle. There are now 2 stitches (sts) on right-hand needle made from original stitch.

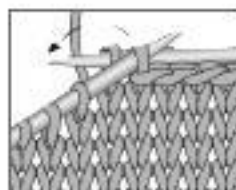


2 K2tog Decrease Knit 2 stitches (sts) together (tog) through the front of both loops.

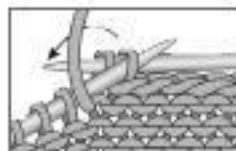


3 P2tog Decrease Purl 2 stitches (sts) together (tog) through the front of both loops.

Casting Off



Cast off using knit stitch (knitwise) Knit the first 2 stitches (sts). *Using left-hand needle, lift first stitch (st) over second stitch (st) and drop it off between points of the 2 needles. Knit the next stitch (st); repeat (rep) from * until all stitches (sts) from left-hand needle have been worked and only 1 stitch (st) remains on the right-hand needle. Cut yarn (leaving enough to sew in end) and thread cut end through stitch (st) on needle. Draw yarn up firmly to fasten off last stitch (st).



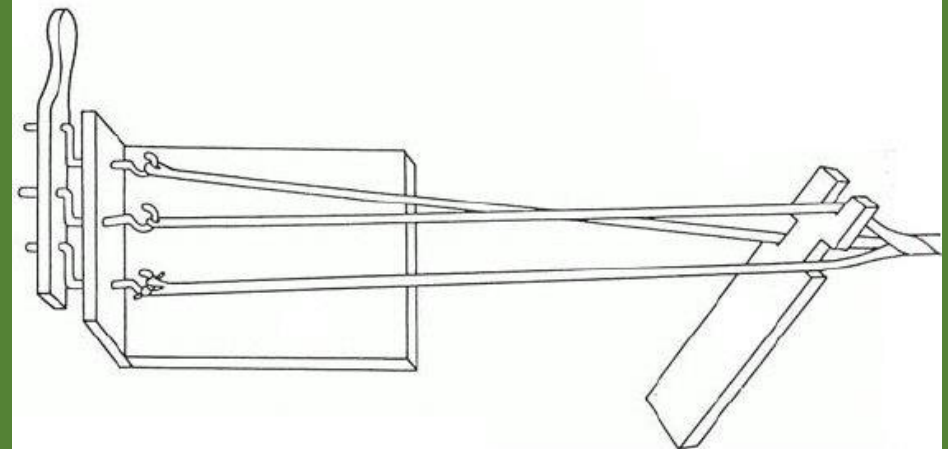
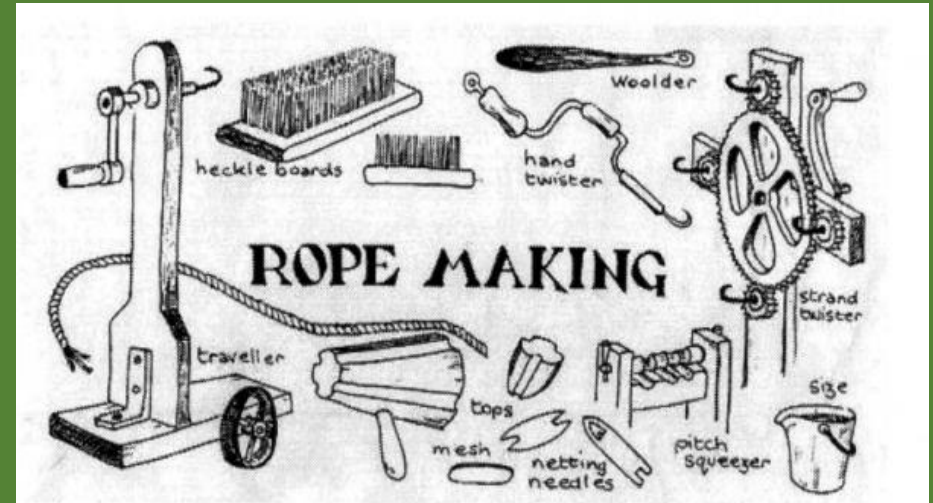
Cast off using purl stitch (purlwise) Purl first 2 stitches (sts). *Using left-hand needle, lift first stitch (st) over second stitch (st) and drop it off needle. Purl next stitch (st); repeat (rep) from * securing the last stitch (st) as described for casting off knitwise.

Rope Making

• Many plants with stalks have thread-like fibers; some plants such as inedible flax and birch are grown specifically for their fibers; the tufts leftover from combing flax (called tow), the trimmed waste from wool, and leftover cotton worked into plant fibers cuts down on waste and improves rope

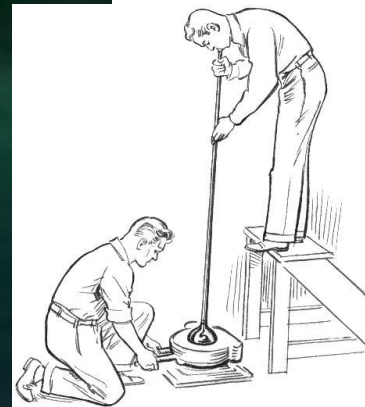
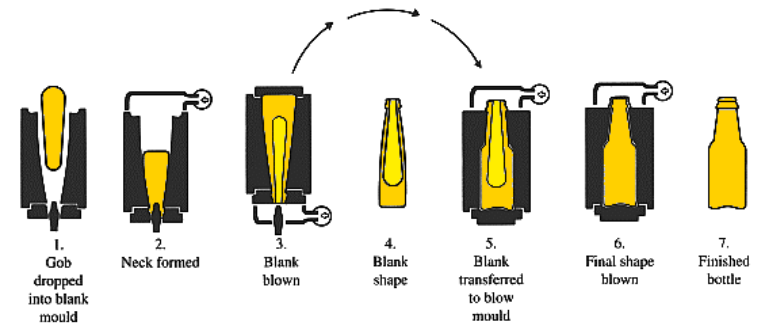
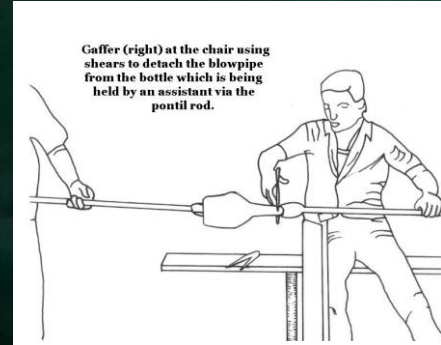
• When fibers are extracted, spin them into threads for use as twine

• To make rope: set up a traveler at one end of a long walk, place supports at intervals to keep the twine off the ground, and finally the strand twister at the other end of the walk; string the twine at one end and walk to the other and back again dozens of times so there are four groups of 14 strands; turn the strand twister so the traveler moves in $\frac{1}{10}$ the overall distance by turning the hook on the traveler to twist the strands against each other to finish the rope



Glass Making

- Very similar to melting metals, glass requires a different set of tools and methods while handling
- Home production of glass is more intensive than working with plastics and composites, and requires a larger investment
- Small scale operations are better suited for artisan and glassblowing techniques as opposed to mass production machinery



GLASSBLOWING 101

w/ GLENN ZIEMKE

COLOR
PREHEAT



FINISHED PIECES
COOLED OVERNITE



GLASS IS:

80% SAND
10% SODA ASH
10% LIME

COLORS = METALS

COBALT = BLUE

GOLD = RED

CHROME = GREEN

MAGNE = PURPLE

SILUM = PURPLE

COPPER = DARK

RED



GLASSBLOWER
GATHERING
HOT GLASS

PUNTY

PUNTY ROD

PADDLES &
BLOCKS IN WATER

PROpane
FUEL TO
HEAT
FURNACE

GLORY
HOLE -
REHEAT

CLEAR
FURNACE

2000°
GLASS



CRUCIBLE
INSIDE



STEEL
TABLE
FOR
SHAPING
HOT GLASS

2000 BC	100 BC	400 AD	1900's	1960's	1976	1995
EGYPTIANS DISCOVER GLASS	BLOWPIPE INVENTED	ROMANS SPREAD GLASS BLOWING	INDUSTRIAL REVOLUTION = LESS GLASSBLOWING	STUDIO GLASS MOVEMENT	G.Z. AT PENN STATE	THIS STUDIO OPENS

Glass Furnaces

- Glass furnaces are the same as metalworking ones with the exception there are two furnaces working (or two separate openings for one furnace): one for melting the glass at 2000° F and one for keep glasswork hot and malleable around 1600° F; there's also a heated cabinet called an Annealing Box used to gradually cool pieces
- The 1600° F furnace is covered with a two-piece door with a small opening to allow the pipe to protrude when pieces are inside; this opening is called a “glory hole”; legend says the name comes from the small hole King Nebuchadnezzar peered through to see Shadrach, Meshach, and Abed-nego inside the furnace with the Son of God



How to Blow Glass

- In a crucible add the right mix of silica, powdered limestone, soda ash, powdered dolomite, and shattered glass pieces (whatever the use is for – follow the recipe exactly) into a furnace and allow the glass to heat to 2500°F ; the type of glass used for blowing is called “cane”; when the glass in the furnace begins to form bubbles then it’s melted correctly and ready to work; dip a blow pipe tip into the molten glass and remove a bulb of it; the amount depends on how big the finished glass piece will be
- Now start “free blowing”; start by rolling the blob of glass on a metal table called a marver to give it an even shape; next, gently blow small puffs into the tube and cover the hole with your thumb when not blowing; this forms an elastic skin in the glass called gather; either blow freely or blow the glass into a negative mold into the desired shape; right after blowing and shaping place the glass back into the furnace through the glory hole to keep it hot, and then repeat until done. Free blowing is all about rotating the pipe, swinging it, and using appropriate tools to create the desired shapes and cuts
- Unlike blacksmithing you never want to quickly cool the glass – causes weakness, cracking, and shattering; bring the temperature down ever so gradually in a heated and ventilated oven called an Annealing Box; the whole process can take multiple hours to days

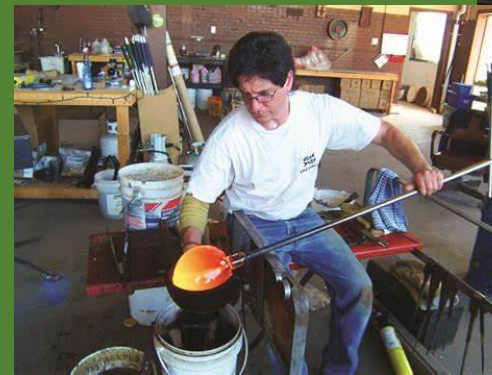
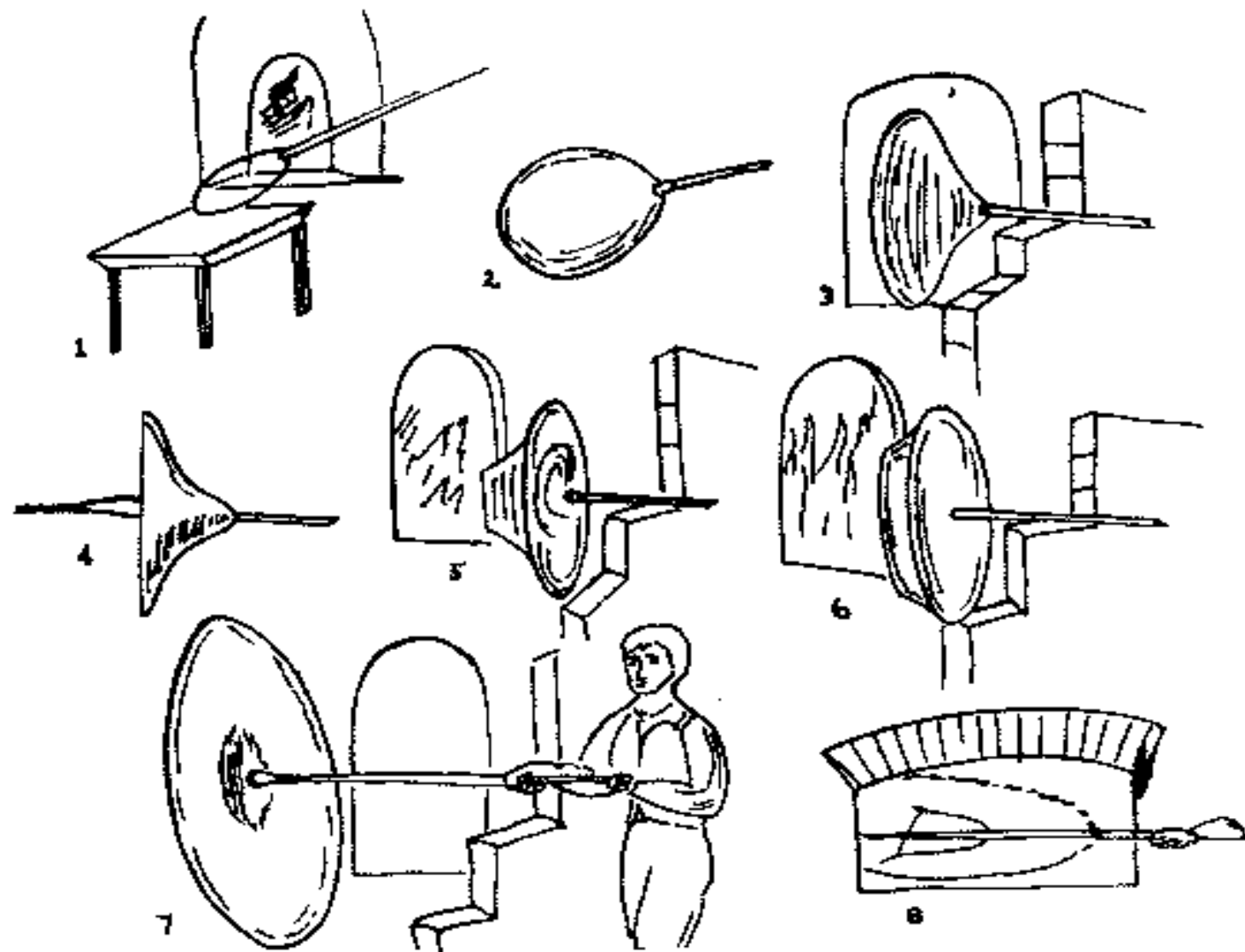


FIG. 48 Method of making crown glass. A large bubble was blown, a pontil rod was attached opposite the blowpipe, and the blowpipe was cracked off, leaving a hole in the bubble. The bubble was then reheated and twirled several times so that it became flat and disk-shaped. The disk was cooled and cut into panes of glass. (*Photo by The Corning Museum of Glass; illustration copied from K. M. Wilson's drawing in Glass in New England, an Old Sturbridge Village booklet*)



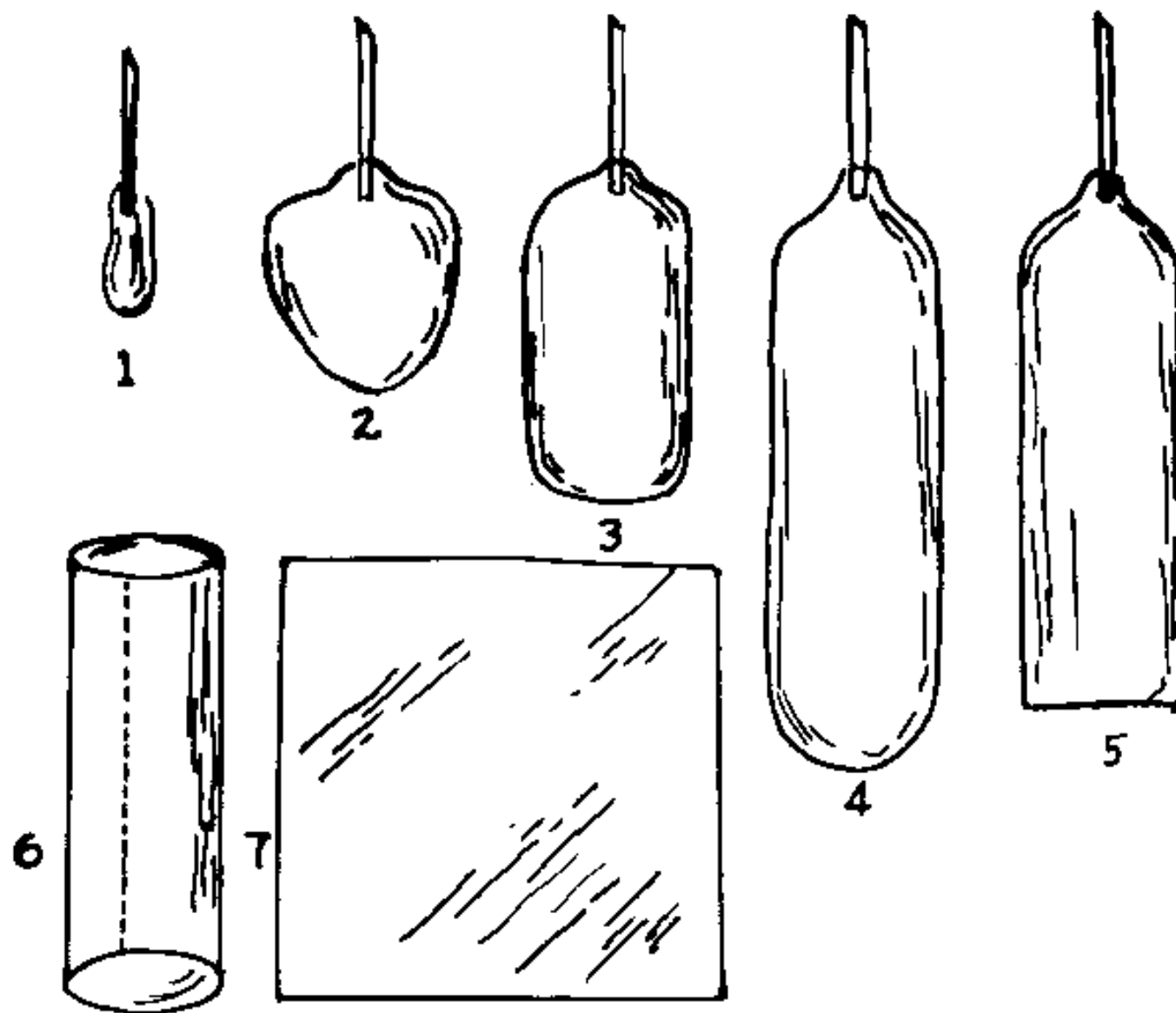


FIG. 41 Steps in the process of making window glass by the cylinder-glass method. A cylinder about five feet long and one foot in diameter was blown; then the end was cut off, the blowpipe was cracked off, and the cylinder was slit and opened out into a flat sheet. (Photo by The Corning Museum of Glass, illustration copied from K. M. Wilson's drawing in *Glass in New England, an Old Sturbridge Village booklet*)

Energy Production

- In the old Deseret days up to the 1980's, the Saints stored firewood and/or coal as the main source of heat and cooking; today's clean air restrictions limit burn days, but there are more fuels and options available to us now
- Propane tanks and charcoal keep for months in proper containers, and ways of creating methane gas on your property clears space otherwise taken up by cords of firewood
- Follow all civil guidelines as improperly or excessively storing fuels on your property can lead to mass casualty events



Firewood

- For the times we can burn, any wood is firewood
- To split logs for the fireplace, saw the log into a standard 2 foot length and cover with a plastic tarp for 6 weeks; split with an ax or maul
- For logs too big for an ax, use a wedge to do the first few splits; a froe and mallet will split large logs with more precision than with just an ax
- If using firewood exclusively, best to get a gas or electric splitter
- For use in wood burning stoves; split the firewood further with a hatchet
- Due to air quality issues and politics, firewood usage is severely restricted



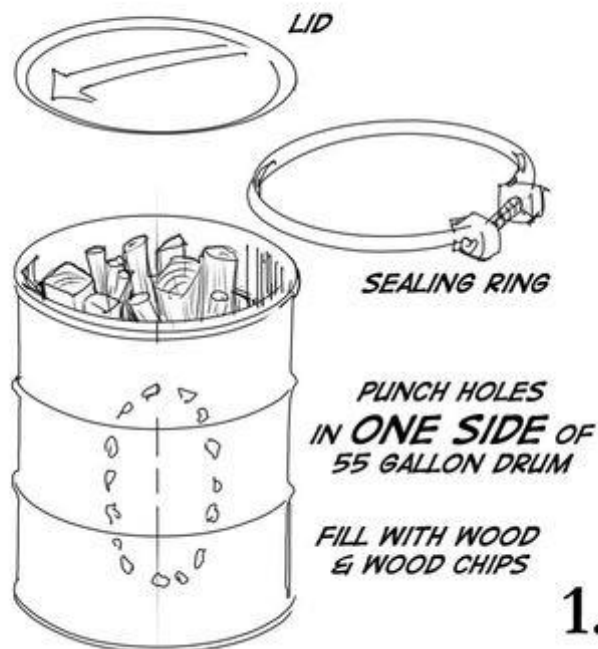
Charcoal

.Charcoal is a light, black residue, consisting of carbon and any remaining ash, obtained by removing water and other volatile constituents from animal and vegetation substances

.Charcoal is made by setting wood alight in a large fire, and then quickly covering the fire to cut off all air; when the pile is cooled off, uncover and store for later use

.Good way of using small pruned branches and woodworking scraps



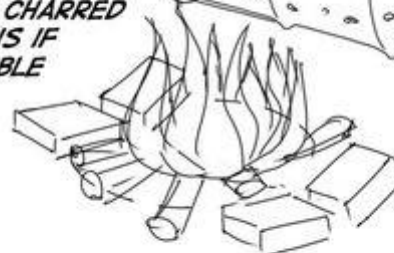


1.

CONSULT LOCAL
BURNING OFFICIAL
OR FOREST SERVICE RE
OPEN FIRE PERMIT

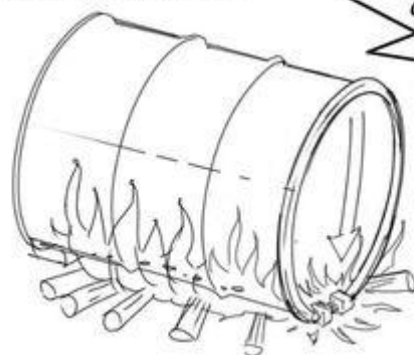
SET 4 BRICKS
AS A CRADLE

START SMALL FIRE
USE PARTLY CHARRED
REMAINS IF
POSSIBLE



2.

ROLL THE DRUM ONTO THE
CRADLE BRICKS OVER THE FIRE
SO THAT THE PUNCHED HOLES ARE
DOWN IN THE FIRE



CAUTION!! HOT
INVISIBLE
GASES

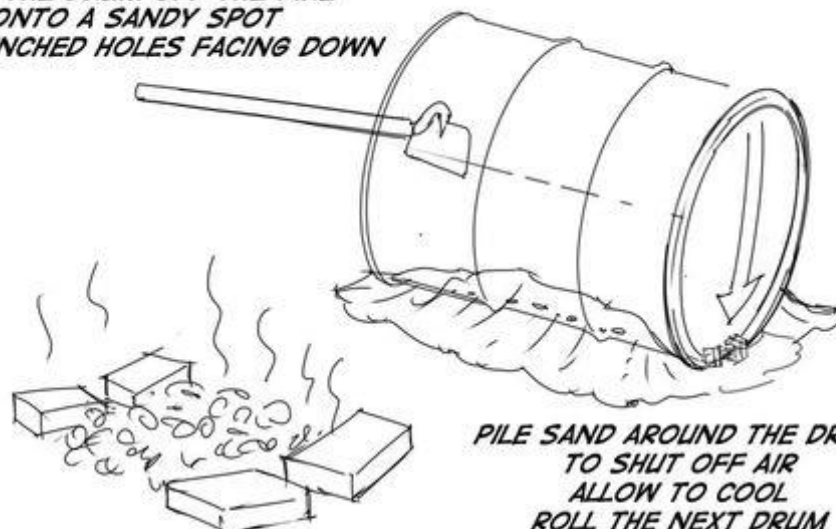
GAP IN
SEALING RING
SHOULD BE DOWN
IN THE FIRE, TOO

KEEP THE FIRE GOING FOR SEVERAL HOURS
YOU WILL SEE GASES ESCAPING FROM THE
DRUM INTO THE FIRE AND BURNING UP.
WATCH FOR DRUM GASES TO PETER OUT

3.

WHEN YOU THINK IT'S DONE
ROLL THE DRUM OFF THE FIRE
ONTO A SANDY SPOT
WITH PUNCHED HOLES FACING DOWN

4.



PILE SAND AROUND THE DRUM
TO SHUT OFF AIR
ALLOW TO COOL
ROLL THE NEXT DRUM
ONTO THE FIRE

WET THE CHAR, GRIND IT, ADD NUTRIENTS, COMPOST & FUNGI
WORK IT INTO YOUR GARDEN

STAY TUNED FOR BIOCHAR SYSTEM
DESIGN CONTESTS AT

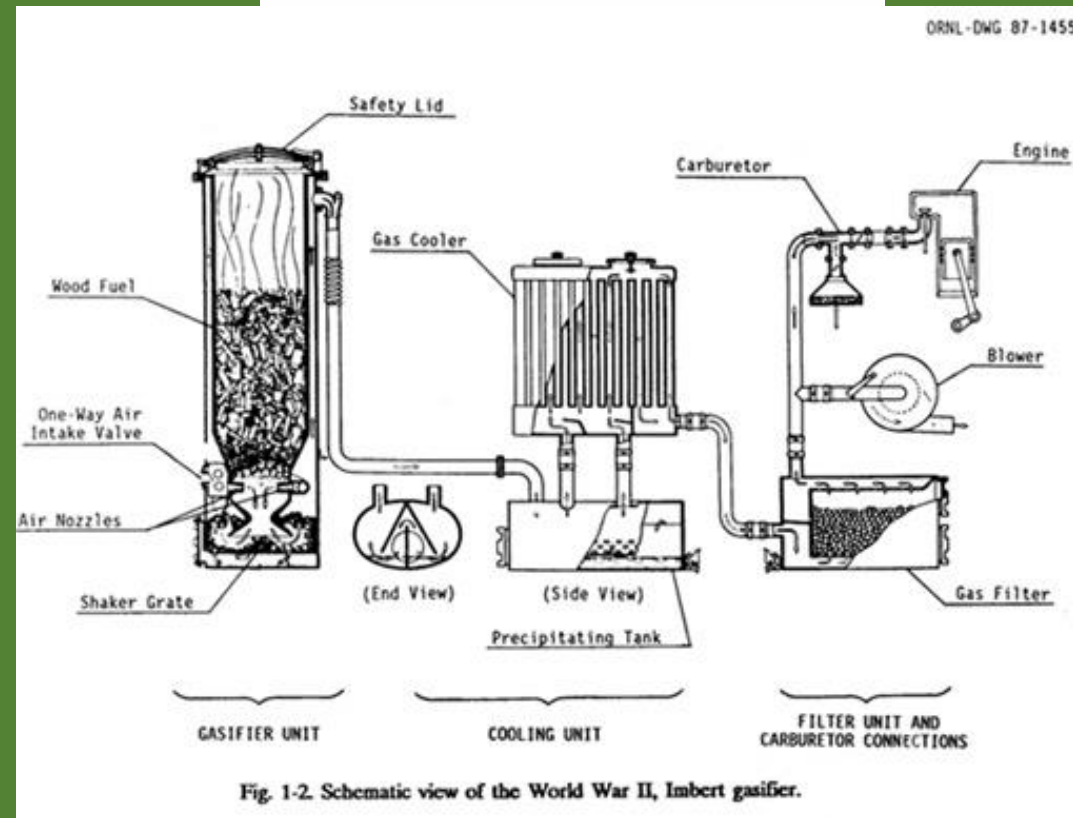
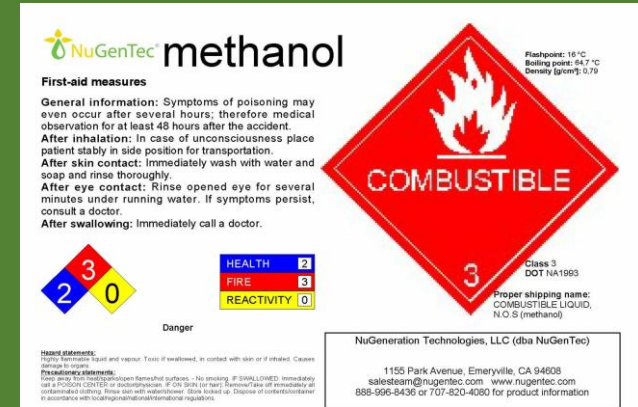
www.DIYbioChar.org

Methanol (Wood Alcohol) Extraction

- In the 1940's, with fuel shortages during WWII, many transportation companies and emergency responders turned to wood gas powered diesel vehicles

- When wood is heated, it releases methanol that ignites the fire in your fireplace, but most of the methanol goes up the chimney – a gasifier collects all of that gas, condenses and filters, and finally sends it into the diesel engine

- Methanol fumes are very toxic



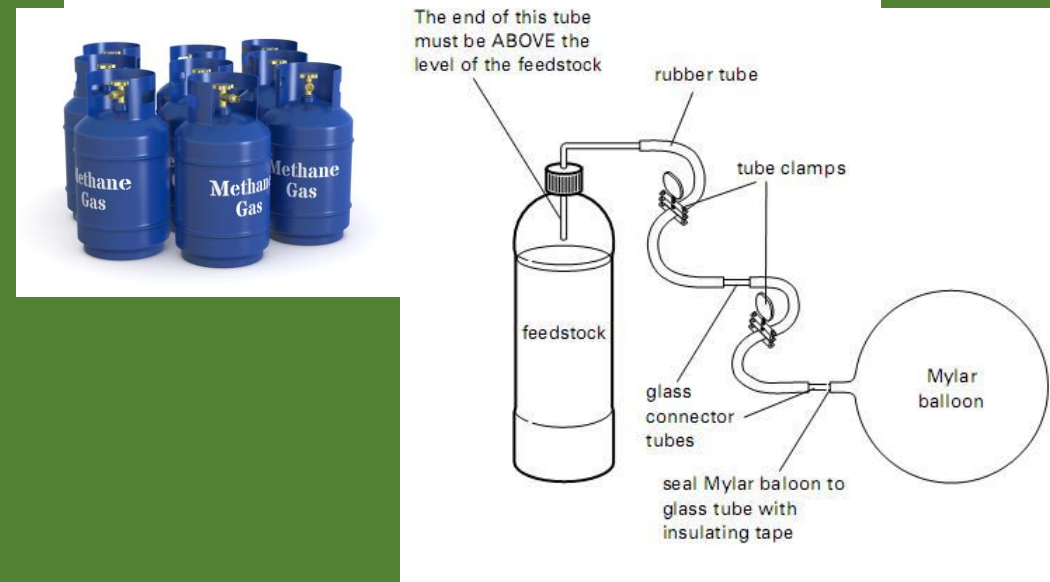
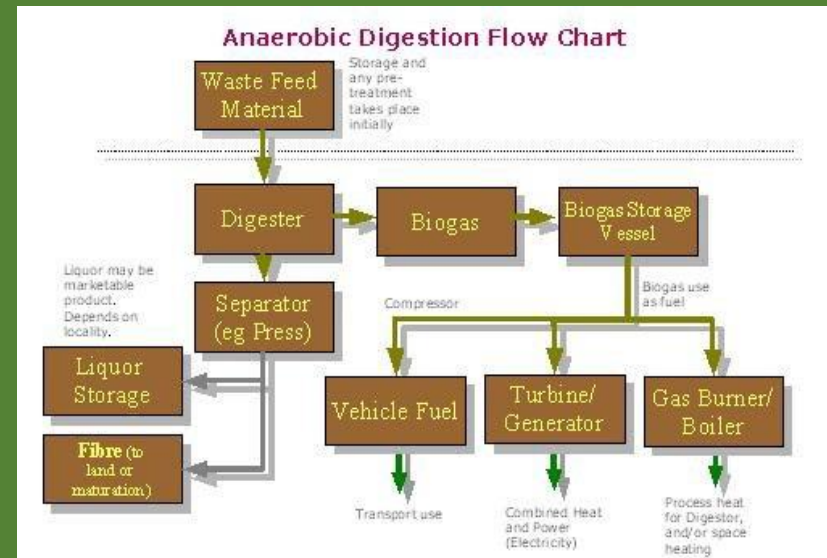
Methane Digester

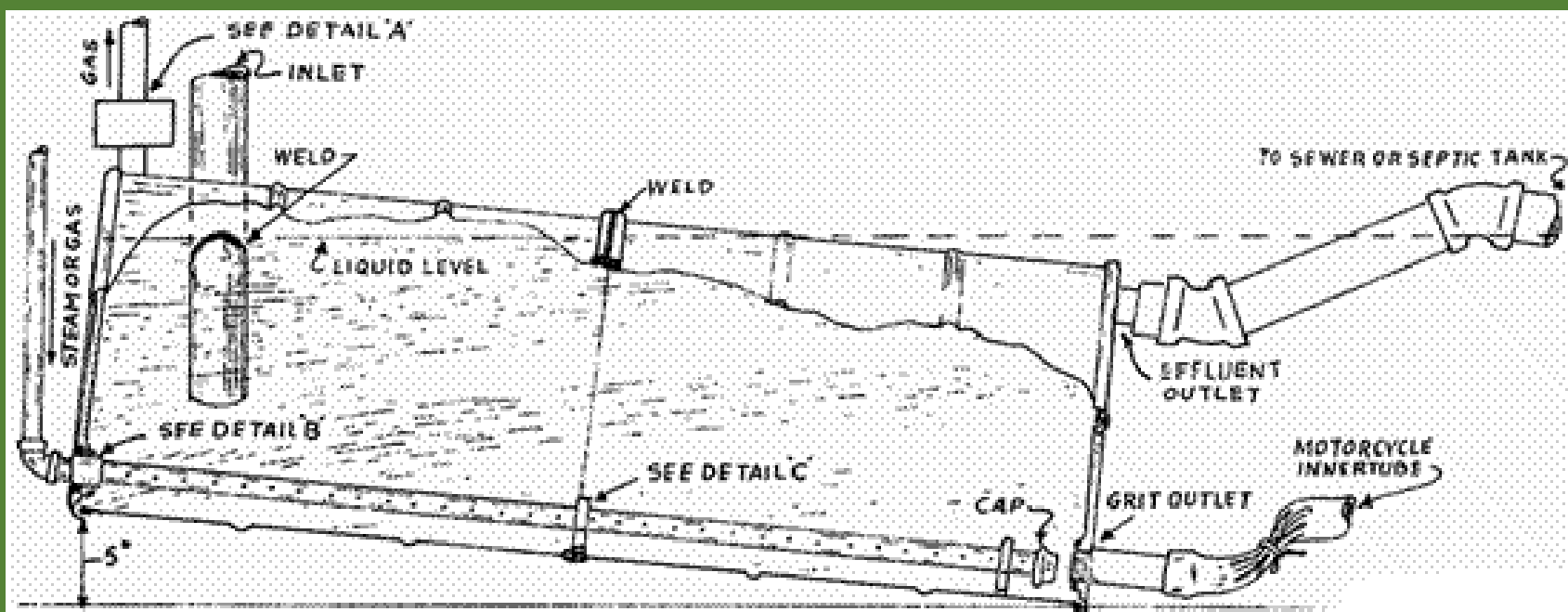
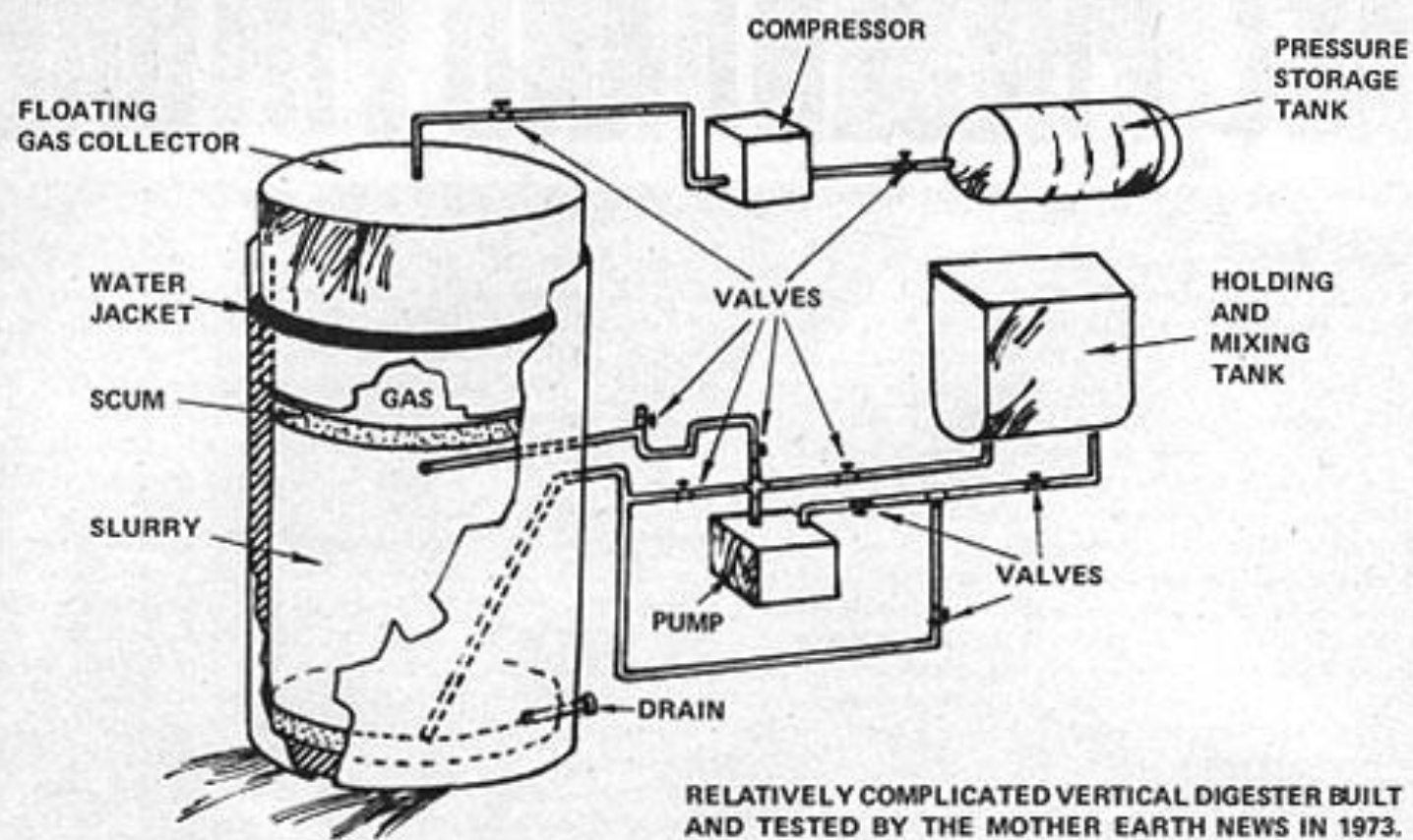
• Anaerobic digestion is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen; a methane digester takes in waste products (leftover foods, animal manure, human restroom waste, etc.) and microbially processes it into methane (natural) gas, industrial chemicals, and clean refined fertilizer

• Having two systems – one for livestock, one for human feces would be ideal; a solution to what to do with human wastes if there's no sewer system for an extended period; building a collector/digester directly under a rabbit hutch is ideal, but would need a way to separate the urine from the feces

• To build a system: there are many plans online but they all have similarities: oxygen is cut off from the microbes by a water seal, there's two major chambers (a waste collection / digestion chamber and a gas collection / reservoir chamber), means to access all parts of the system without introducing oxygen (for waste depositing, gas removal, sludge removal), the system needs a heater to prevent the microbes from freezing; adding a gas compressor for bottling is ideal

• When compressed the gas can run cooking stoves, power generators, automobiles, etc. This fuel source will reliably supply a family with fuel and power better than most; however, it's very dangerous to do in an urban environment: best to have the digester inspected by a professional before use





2" PUMPED WASTE IN,
CONNECT TO FEED PUMP
DISCHARGE

CUT HOLE IN 4" CAP, FOR
2" SYS FPT BULKHEAD FTG

2" EFFLUENT OUT, OVERFLOW TO
DISPOSAL OR POST-PROCESSING

4x4x2 SAN TEE GLUED TO LID

4" PVC COUPLING GLUE
TO UNDERSIDE OF LID
SLIP 4" SEWER PIPE INTO
COUPLING (NOT GLUED)

4" CELLULAR CORE ABS. (OR
COAT W/ WP INSULATION?)

2" BULKHEAD FITTING, SxS
TYP. SLIP PIPE INTO
FITTING, DO NOT GLUE.

3/4" HDPE TUBE BENT INTO
HOOP, WELDED TO TANK

1/4" HDPE SHEET, FASTEN
TO BLKG W/ SS SCREWS

2" PVC HOSE BENT TO FRICTION
FIT INTO TANK PERIMETER

NOTE: PIPE & FITTING LOCATIONS
SHOWN OFFSET FROM ACTUAL, FOR
CLARITY (SEE PLAN VIEW.)

3/4" VINYL HOSE

3/4" PVC

2" RIGID INS. SECTIONS, TRIM
FOR TIGHT FIT AROUND PIPES

3/8" HDPE TOP, GASKETED,
BOLTED TO TANK FLANGE.

3/4" BULKHEAD FITTING, SxS

3/4" MPT X SLIP
3/4" MPT X HOSE BARB,

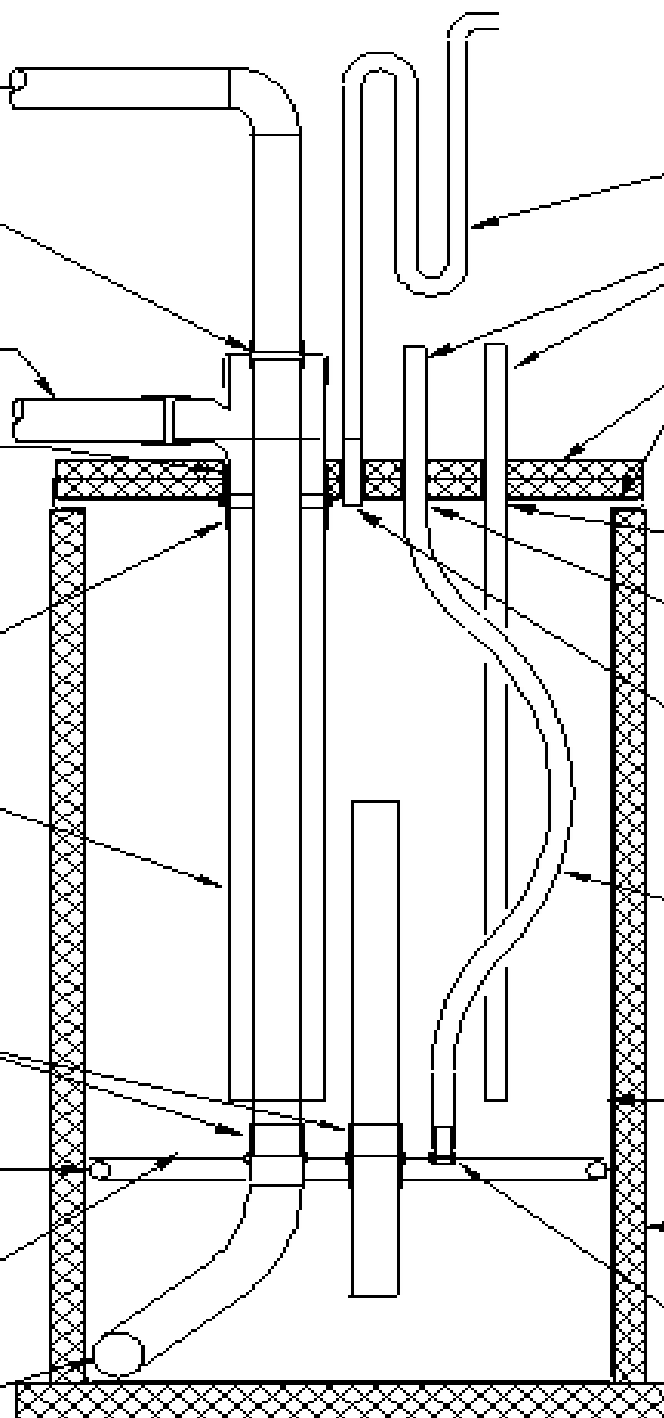
3/4" BULKHEAD FITTING,
3/4" MPT X HOSE BARB

3/4" HOSE. PROVIDE SLACK TO
EASE CONNECTION TO LID FITTING
AND ALLOW LID REMOVAL.

24" DIA X 48" HIGH, 90 GAL
OPEN-TOPPED HDPE TANK.

INSULATION: 2 LAYERS REFLECTIX,
1" FOIL-FACED RIGID KERFED TO
BEND AROUND TANK & STRAPPED.

3/4" BULKHEAD FITTING, W/
3/4" MPT X HOSE BARB.



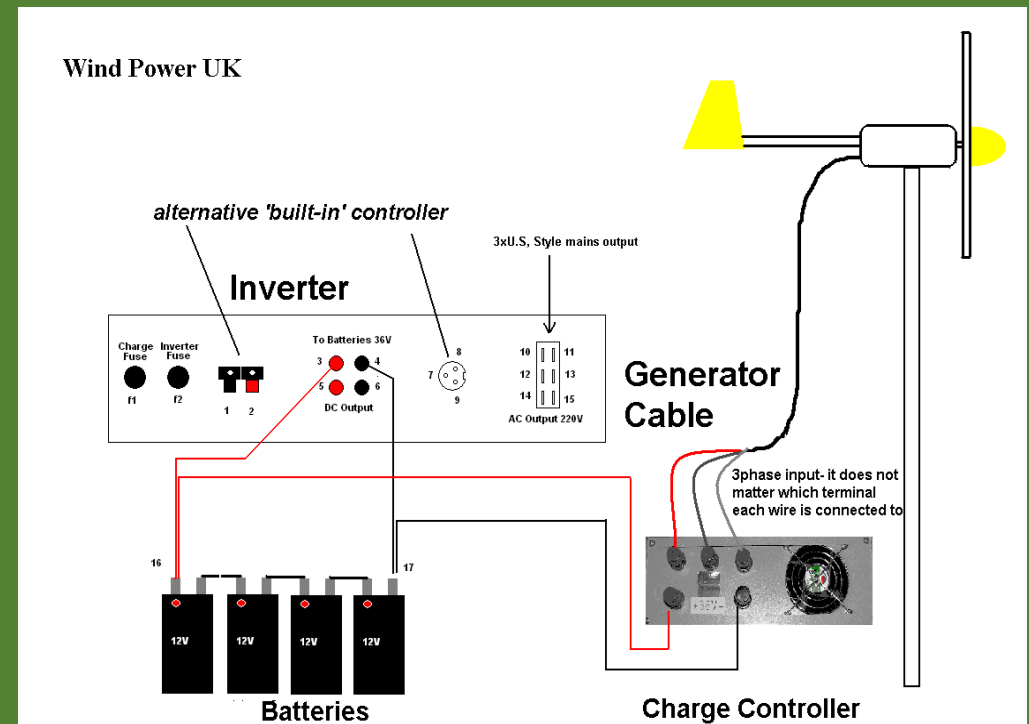
Windmill Turbine

• Wind power is hard to win and store, so you should always use wind-generated electricity sparingly – wind power (even with a commercial turbine) is only a backup source

• In order to exploit wind power you must have an average wind speed of at least 9 mph, with no lengthy periods of low winds; even so you will need battery storage to cover up to 20 consecutive days of calm

• Apart from an electricity-generating windmill, you need a voltage regulator and a cut-out to prevent the battery from overcharging

• Total battery-storage capacity needs to be: 20 X average current needed in amps (watts-^volts) X average usage time in hours per day, measured in amp hours. Standard domestic electric appliances requiring 220 volts AC can be driven from a bank of 12 volt (DC) batteries by an electronic inverter



Building a Wind Turbine

- The typical electricity generating windmill is available in kit form or as a do-it-yourself design
- Wind turbines are different from windmill water pumps as turbines are going for speed instead of torque; and windmill water pumps are far more efficient and useful
- The aluminum or fiberglass blades are pivoted from the hub: centrifugal force works on the balance weights and overcomes a set of springs attached to the hub shaft, so the blades feather automatically if the rotor overspeeds. A toothed rubber belt drives a car alternator
- Power is transmitted down the inside of the tower, either through a conducting slip ring and brush, or by a cable which won't be damaged when it's twisted, thus providing a non-breakable connection; similar arrangements might be improvised though they might suffer in reliability
- Need a building permit to install one on your property



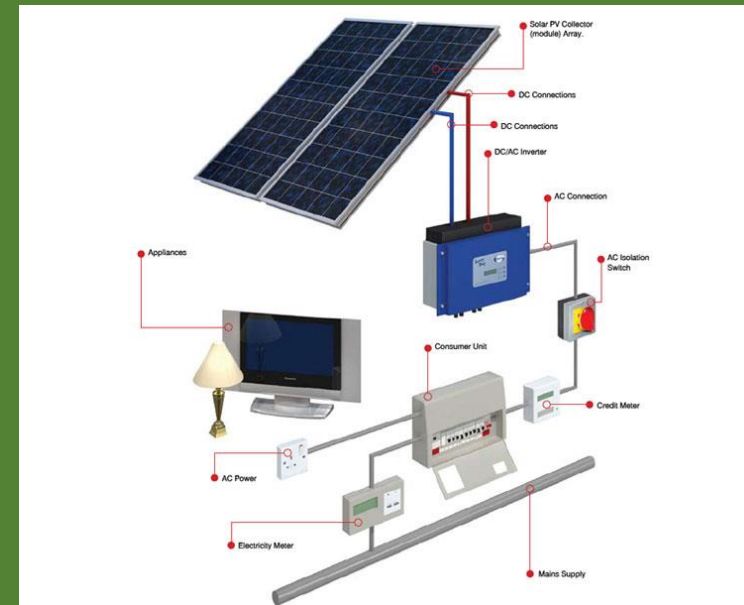
Photovoltaic (Solar) Panels

- Solar panels bundled as part of a larger photovoltaic system to generate electricity

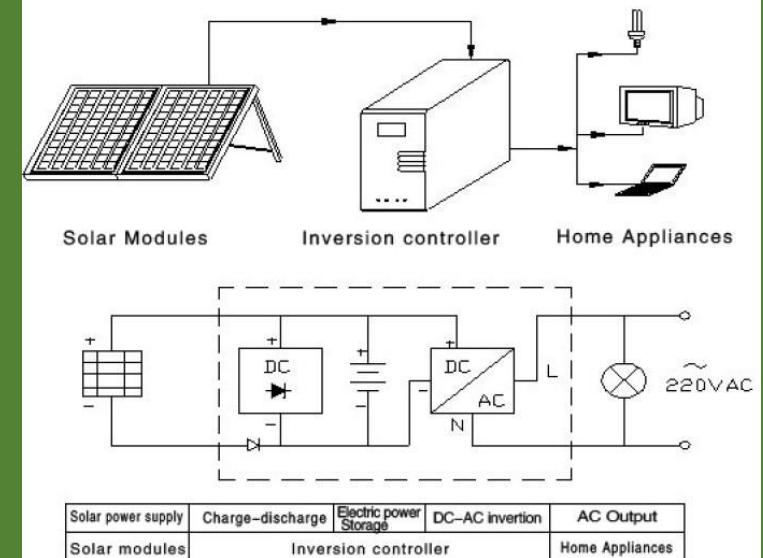
- Newer panels have the ability to gather in overcast days and very resilient to impact damage; unfortunately the other parts of the system will fail on a regular basis – especially the control and distributor modules

- To be truly independent and off the power grid with just solar panels requires a 2 kWh, 30 amp system with a minimum bank of 50 batteries and 12 hours of sunlight every day, 365 days a year; this sort of setup is very expensive in our region

- Solar panels are best tied with a wind turbine to a multi-power source system as backups for an electrical generator that will do most of the work; true power independence



Work Principle

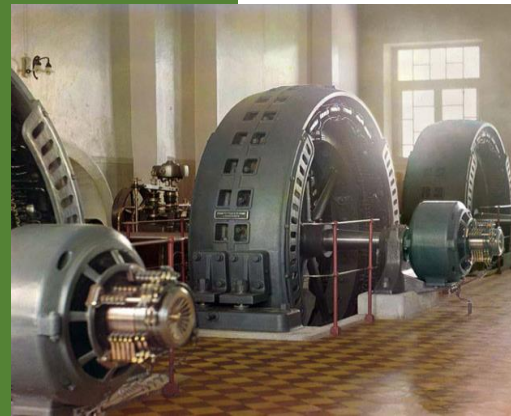
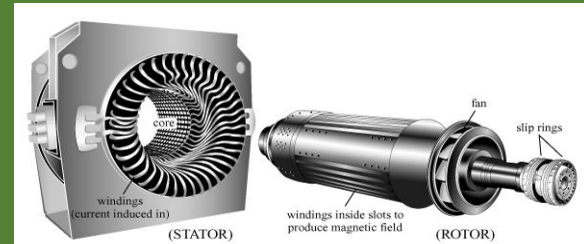


Electrical Generators

- A generator is a device that converts mechanical energy to electrical energy for use in an external circuit; the source of mechanical energy may vary widely from a hand crank to an internal combustion engine; generators provide nearly all of the power for the US electric grids; uses gasoline, propane, steam, or compressed methane (natural) gas

- Attaching a lawn mower motor to a car's alternator is a cheap and easy generator; add breakers/inverter and transformer

- Send all unused power into a battery bank for later use



Circuit Breaker Wiring Diagram

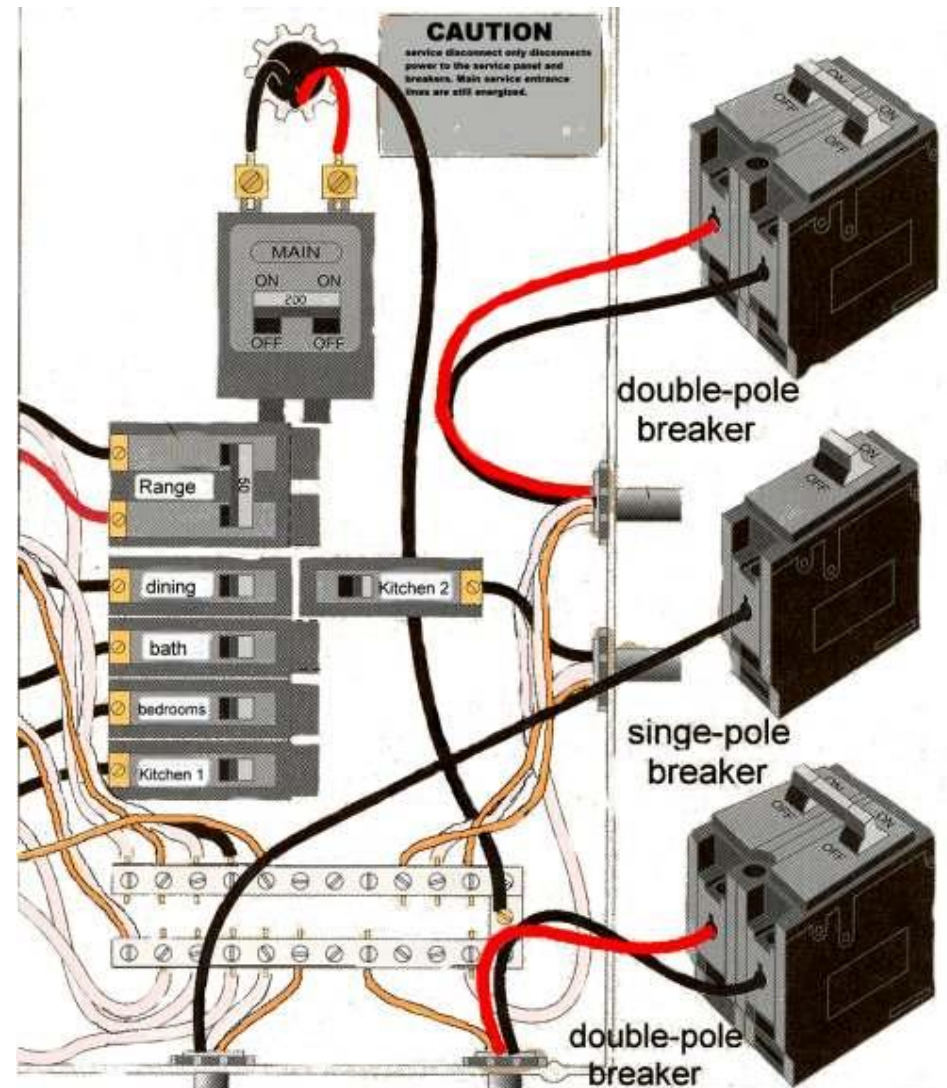
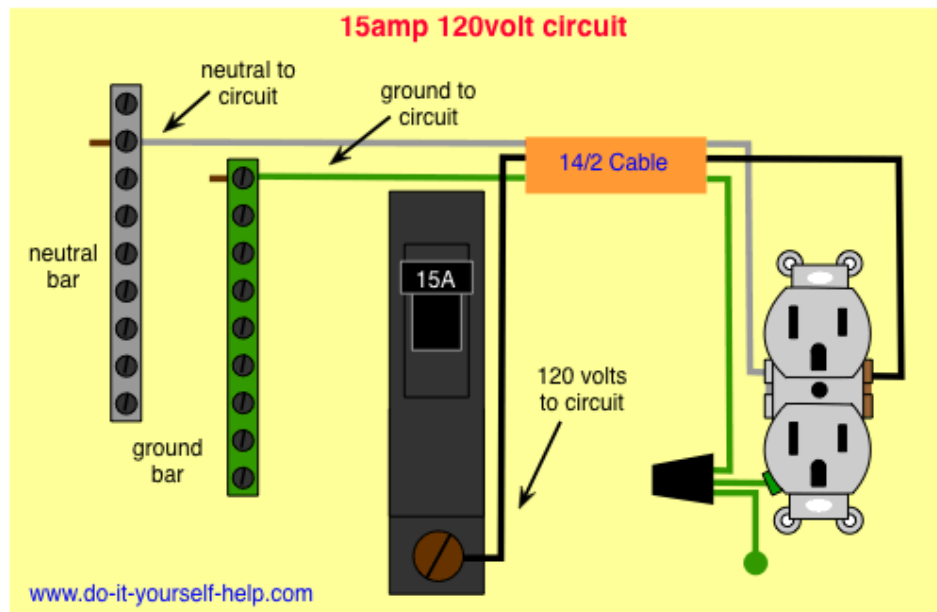
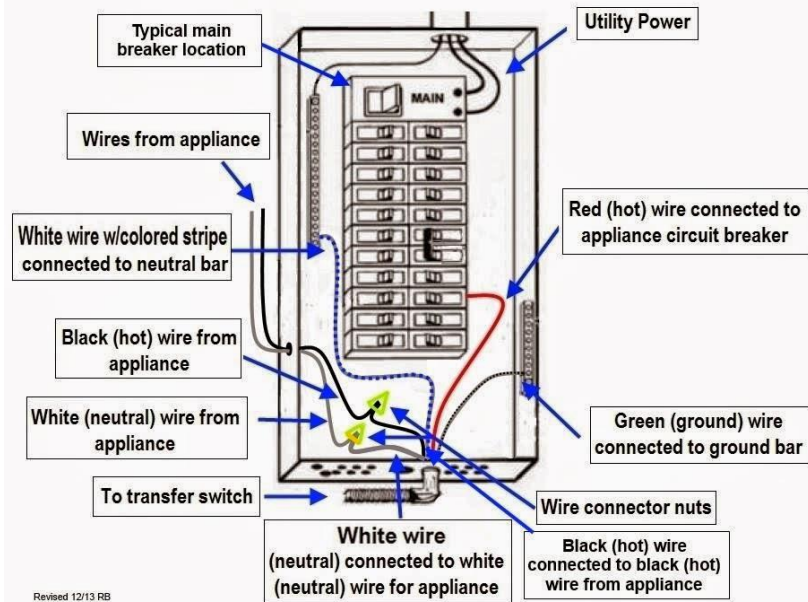
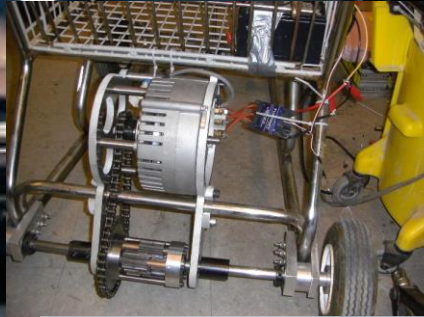


FIG. 9.26

Transportation

- Our ancestors came to the Salt Lake Valley in covered wagons using draft and pack animals; to cut down costs, handcarts were used – a feat oft repeated on Pioneer Trek
- Transportation is essential for our society and is often a volatile issue with road construction, fuel prices, natural disasters, and the like; a variety of transportation vehicles alleviates some of these problems
- New cars cost tens of thousands for a vehicle that only has a few hundred dollars worth of components and programming into it; be creative and imaginative within the law to make something useful that fits with your family's needs
- The difficult part of getting a car or vehicle street legal in Utah is the chassis; probably best to buy a prefabricated one instead of working through several years of government testing



Urban Draft Animals

•Not a common sight; large to giant dog breeds, and teams of medium-sized dogs, can be trained to harnesses and used as draft animals

•Families are limited to 2 large dogs per household by law

•To acclimate a dog to draft work: first train to a harness and getting comfortable with that, followed by a set of 'training wheels' (a rig with two wheels and no weight), followed by the cart and slowly training the dog to weight



Scooters and Mopeds

- Used internationally as the primary means of transportation, and during WWII as gas and rubber rationing alternatives, scooters and mopeds work in our area for nine months of the year and then it's too cold and icy
- Does not require any form of licensing or registering; does require a helmet
- Commercial models sell for \$115-\$1,900; kits for motorizing bicycles go for \$80 online; scooter construction plans are free online and easy to build





GAS RATION SPECIAL

Go to market, beach or visit friends on one of these babies and forget your gas worries. You can cover 100 miles or better on one gallon of precious fuel.

by Howard G. McEntee

WITH gasoline and oil getting scarcer all the time, it behooves those of us who are able, to arrange our transportation in such a manner that a little of these commodities will go a long way. A small motor scooter is one of the most economical forms of powered transportation. Unfortunately the supply of these vehicles is limited, with new ones unobtainable, and used ones scarce and prohibitively priced. The answer seems to be "build your own."

The scooter to be described was evolved after the writer secured a second hand engine

in fair shape. This was carefully reconditioned, and worn parts replaced, whereupon it was found to be very reliable in operation. This engine is a Lauson RSC, rated at 1.5 H.P., but any engine of from 3/4 to 2 H.P. or so is satisfactory, as they are all of about the same size and general arrangement. The prospective builder will probably be unable to secure a new engine, but the second hand field is very large. An advertisement in the local newspaper will usually bring results.

Only general dimensions will be given as a building guide, since the construction will

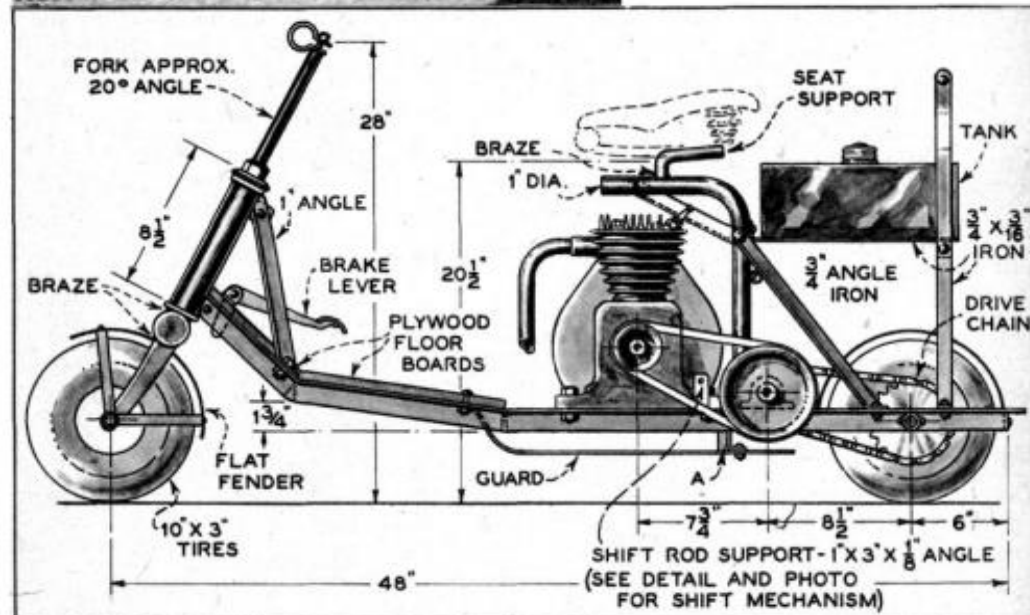


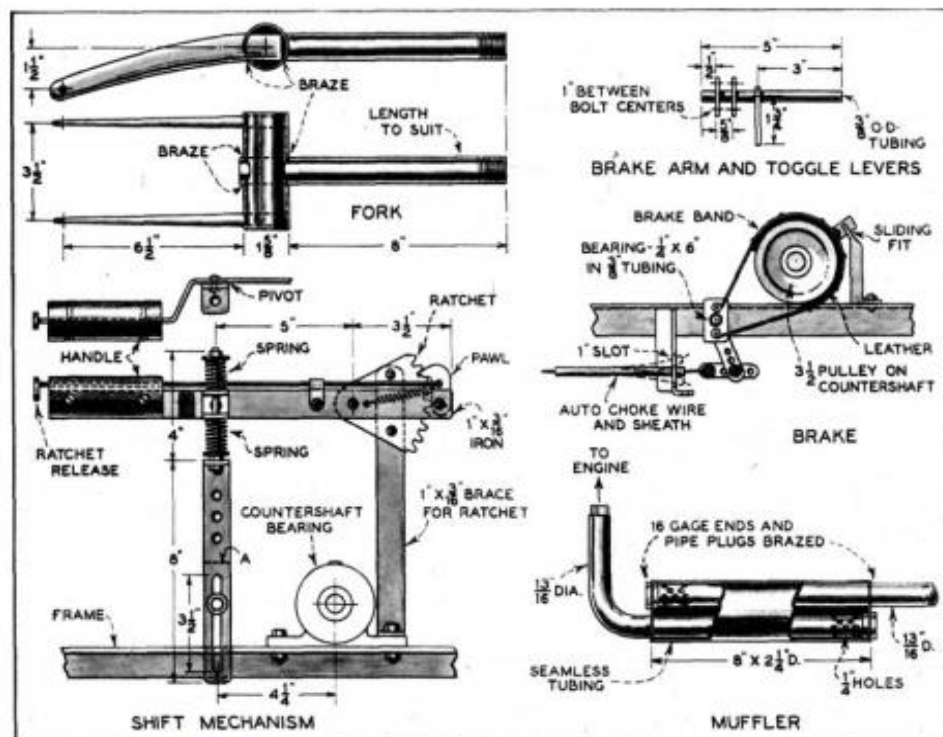
naturally be governed largely by what parts the builder can gather together, as was the case here.

Construction starts, of course, with the frame, which is made of 1-1/8"x3/16" soft angle iron. Beds are a fine source of this material. First the side pieces are cut to length; then with a hacksaw, slots are cut at points A and B (see drawing) on the vertical side, up to but not through the horizontal side, or, in other words, to the apex of the angle.

The pieces may then be bent easily in a vise. After each side member is bent at the two points, and the three cross pieces are cut to size, together with the center motor support piece, they are about ready for welding. First, however, six slots should be cut, four for mounting the engine and two for the rear axle. Those for the engine must be positioned

Left: Completed scooter with lights, horn and rear vision mirror. Some states require twin headlights and tail light for these vehicles. Check with your Motor Vehicle Bureau. Below: Side view shows principal construction points. Motor is at right angles to chassis.





Parts details. Most materials can be obtained from junk. Frame is made from old bed rails.

according to the particular unit to be used, but should be measured so that the motor pulley comes at about the point shown. The welding can be handled by any well equipped auto repair shop.

After these initial welds are made, the side members must be cut once more at points C so that they may be bent inward at the front.

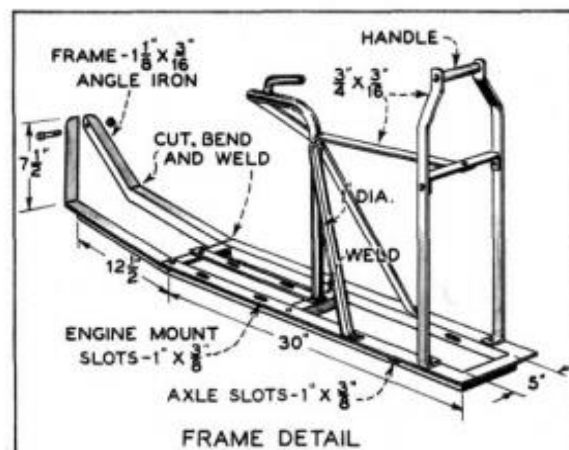
The bearing for the front wheel fork on this scooter is a cast iron piece about 7-1/2" tall and with a tubular stub at top and bottom. It was made for heavy commercial delivery bicycle use, but a bearing tube from an ordinary adult bike will do very well. This piece is held between the upward and inward bent front ends of the frame with a single bolt. The bracing pieces running from points C on the frame up to the top of the bearing tube are of 1"x1/8" angle iron bolted at top and bottom and also welded at the latter point. The tube should slant to the rear at an angle of about 20 degrees.

At points A on the frame a 5/16" bolt is run from side to side with a spacer of small diameter gas pipe between the side members.

The front fork will have to be built up as there is no bicycle part of the correct size. The lower ends, or prongs, of the fork are cut from an old bike frame and are brazed to a piece of 1-5/8" diameter tubing which is 5" long. The prong pieces should be fitted through oblong holes cut in the lower side of the tubing and curved to butt snugly against the inside of the upper portion. The stem of the fork is also cut from a bicycle so as to make available the threaded upper end. This piece is brazed into the 1-5/8" tubing which is first bored or filed out for a snug fit. The bearings and cones from a bicycle fork assembly, together with the nuts and washer that hold them in place, complete this part of the machine.

The neck is much longer than those used on bicycles and must be built up from one of the latter plus a piece of tubing that will fit inside the stem of the fork. The same tightening arrangement as used in standard bike practice is satisfactory. Bicycle handlebars and rubber grips are used.

The seat is mounted over the motor and is held on a cut-down bike seat post brazed to



Here is bare frame with seat support and engine mount shown. Cut slots for hold-down bolts to fit your particular motor.

a curved piece of 1" diameter tubing. This tubing is braced by two pieces of 3/4"x1/8" angle iron which run back to the main frame. The seat itself is of a large, well sprung type that makes for comfortable riding. All joints of the seat support are brazed and the whole tripod may be removed from the frame by taking out three bolts.

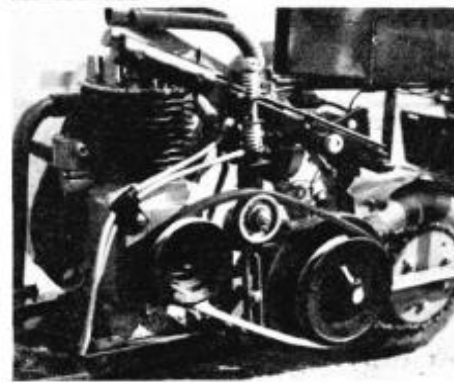
We come now to the power and drive mechanism, where lie most of the procurement and construction headaches. The wheels are heavy duty type with ball bearings, carrying husky 4 ply tires of 10x3 size. The rear tire *must* be of the so-called "lug base" style, meaning that the tire has moulded ridges running crosswise around the inner circumference, which fit into slots pressed in the steel wheels. These ridges or lugs prevent the tire from slipping around the wheel under power. Do not try to use a smooth-type tire as it is wasted time, a fact ascertained by sad experience. Either style of tire, however, may be used on the front wheel. These tires are usually of single tube construction with no inner tube.

Wheels for these small tires are usually made in three pieces, consisting of a hub carrying the ball bearings, and two pressed steel discs to fit in the tire, the three sections held together by [Continued on page 132]

Above: Gas tank feeds motor by gravity. Dome shaped gadget near wheel is generator. Right: Clutching arrangement is operated by idler pulley (center) which raises and lowers to engage or disengage driver pulleys. Wheel itself (with sprocket) is in turn driven by chain from sprocket on pulley shaft,



Closeup of sturdy front fork construction. Licenses are required by some states



Gas Ration Special

[Continued from page 93]

bolts. The rear axle is simply a 7" length of 3/8" diameter rod threaded at both ends and fitting snugly through the center of the bearing on each end of the hub. Spacers between the outside of the bearing and the frame sides position the wheel securely.

The sprocket on the rear wheel is an 18 tooth unit of the disc type, held in place on the wheel by three 3/16" bolts and pipe spacers. The sprocket is held out from the wheel far enough so that it clears the tire by about 3/8", and must be adjusted to rotate absolutely true, with no radial or side wobble. The long bolts are inserted in place of three of the short ones that hold the wheel parts together. Although the sprocket shown is a special unit, most bicycle dealers can supply one with the proper number of teeth, and which can be drilled for the three bolts.

The chain is standard bicycle variety of 1" pitch and 3/16" width, and the two sprockets must, of course, be of similar description. The chain is about 30" in length. While on the subject, it might be said that while the chain mentioned has proved quite satisfactory and will give good service if cleaned and oiled occasionally, a much better drive may be had from the so-called No. 41 N chain. This is 1/2" pitch and 3/16" wide and is used on many racing bicycles as it is more suited to high speed work. The sprockets must be of the same type.

It is quite possible to use V-belt drive from the counter-shaft to the rear wheel. If this is done the wheel pulley should be about 5-1/2" diameter with a 3" countershaft pulley, the idea being to get a 2-1 ratio between the two.

The countershaft sprocket is a 9-tooth size, also a standard bike part, with an added steel hub. The shaft is 5/8" diameter and is carried in a self-aligning ball bearing pillow block at each end. Ordinary bronze-bushed bearings are quite usable, but must be oiled more often. The sprocket hub should be pinned to the countershaft with a taper pin or plain 1/8" diameter rod. Set-screws simply will not hold here for any length of time unless used with a keyway of some sort. After trying vainly to make the sprocket stay put, it was finally pinned, keyed and held by two set screws, and has not budged since being so fastened.

The countershaft is cut flush with the bearing on the right end but projects 2-1/4" beyond the left bearing. On this end are fastened two 5-1/2" diameter pulleys.

The motor pulley is the type with 1-3/4", 2-1/4" 2-3/4", and 3-1/4" steps, only the first and third of which are utilized. The "gear shift" is very simple but highly satisfactory. The two V-belts are left in place at all times but are too loose to provide any power transfer from motor to countershaft. When the shift lever is pushed downward, a pulley is lowered onto the top of the inner belt,

tightening it so that the countershaft is driven. For high "gear" the lever is then raised upwards past the center position where both belts are loose, until another idler pulley is forced up against the underside of the other belt, which tightens it and again drives the counter shaft, but at a higher speed.

The two idler pulleys are of ball bearing construction, and each is held to the shift rod by a single 1/4" diameter bolt. Roller skate wheels are good for this use; if flanged pulleys are obtained they must have a width inside the flanges of at least 1/2". Plain bearing types are not advisable here as the pulleys turn at high speed and are under considerable load.

Some means must be provided to hold the shift arrangement in the desired position, whether up or down. An auto brake lever ratchet and pawl have been adapted for this use, and while the make is unknown, the builder can probably find something satisfactory at his local supply store or "junkie."

Most of these ratchets are designed to hold in only one direction and slip the other way, so the teeth must be filed to such a shape that they will hold in either direction. The pieces are usually case-hardened but can be softened for drilling and filing by bringing them to a red heat for a few minutes, then allowing them to cool slowly.

The ratchet piece was drilled large enough to fit over the bearing of the shift lever and is braced by a piece of 1"x3/16" steel running down to the frame. The bearing is a piece of brass tubing 5/8" in diameter with 1/32" wall thickness, inside which is the shaft itself, a length of 1/2" diameter rod, turned down to 3/8" at each end and threaded. The tubing is brazed to the angle iron seat braces.

The shift lever is bolted onto its shaft with the pawl on the overhanging rear and actuated by a 3/16" rod run forward through the wooden handle. A spring keeps the pawl tightly against the ratchet except when the push rod button is depressed.

The shift rod which carries the two idlers is held to the lever by a single 1/4" diameter bolt and another bolt of the same size keeps the lower end of the rod in place. The slot is 3-1/2" long which allows the rod a vertical movement of about the same distance. Both of the bolts are provided with bronze bushings to reduce wear. The rod must be held out about 7/8" from the frame so that one idler can be placed on each side. The holes for the idler pulley bolts should not be drilled until the motor and countershaft are mounted and the pulley and belts put temporarily in place to be sure the idlers will be in the proper location.

A spring coupling is provided between the lever and rod as may be seen in the illustration. The rod is bent out at right angles at the top and an

[Continued on page 142]

Gas Ration Special

[Continued from page 132]

extension made from a 3/8" diameter bicycle rear wheel shaft bolted on. This slides through two holes in a U-shaped metal piece, with a spring at top and bottom. A bolt over the upper end keeps the whole assembly in place and is turned tight enough to place the springs under considerable pressure. Such a device prevents overstretching the belts and makes the drive smoother.

This completes the heavy construction work, but many other details remain. The floor boards are of 9/16" plywood held on with bolts. On one side a cut-down bike kick-stand is fastened, bolted both to the floor and the frame for strength.

The motor is fitted with a simple muffler and a long tail pipe and is surprisingly quiet in operation. Construction details are shown on the drawings.

The muffler body tubing and the exhaust pipe ends are closed with discs of 1/16" steel sheet brazed in place. The small tubing has about 20-1/4" dia. holes in each piece which appear to be ample.

A guard piece of 3/4" x 1/8" strap iron, bent upward at the front and bolted to the floor board, runs rearward about on the centerline of the frame. The rear end is supported by the angle piece which guides the after end of the brake cable. This guard projects about 1" lower than the muffler and protects the brake mechanism, and the countershaft pulleys as well, when the machine is being lifted over curbs and other obstacles.

The sheet metal gas tank is fastened to the seat support in front and the rear is held up on a frame of 3/4"x1/8" strap iron. This frame is extended over the tank to form a handle that is very convenient when lifting the vehicle.

Front and rear fenders are bent from No. 20 gauge sheet steel; the one in front is braced by strips of 16 gauge sheet riveted in place. Both fenders are the flat crownless type—all that can be made without extensive sheet metal working equipment.

The brake is external contracting and works on an ordinary 3-1/2" V-pulley keyed to the countershaft. The brake band, cut from 20 gauge steel, has a lining of heavy leather. A simple toggle arrangement tightens the band around the V-belt and is actuated by a foot pedal on the floor board. The two are connected by a piece of auto choke wire.

The carburetor controls of choke and throttle are on the handlebars, operated by bicycle-type flexible wire cables.

Some States (such as New Jersey) require two headlights and a tail light before a license will be granted. The lights used here are all bicycle products operated by a small bike generator driven by the rear tire. As this does not produce quite high enough voltage, the generator is now being belt driven from the countershaft.

A great deal of experimentation has been done to ascertain the proper drive ratios. Although the photos show different size pulleys on the countershaft (they were 5" diameter for "high" and 6-1/2" for "low") these have been replaced by two of 5-1/2" dia., which seems about right for the

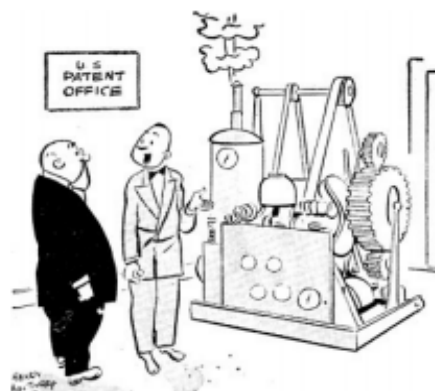
motor used. The ratio from motor to rear wheel (using pitch diameters of the pulleys which average 1/4" less than outside diameter) and including the 2 to 1 afforded by the chain drive is thus about 4.2 to 1 for high and 7 to 1 for low. This provides a top speed of about 25 m.p.h. in high and makes for easy starting and plenty of power for hill climbing in low. Using the pulleys shown in the photos, the ratios were 3.8 to 1 and 8.3 to 1 respectively, but these were thought to be a bit too far each way for best

results. All the belts and pulleys are ordinary 1/2" wide home workshop equipment.

A simple device was developed to prevent the V-belts from pulling when the shift is in neutral, a natural tendency even though they are quite loose. An angle bracket is mounted on the motor crankcase, the end projecting outwards just in front of and below the motor pulley. To this are bolted two strips of brass 1/8"x5/8"x2" long, bent so they just clear each belt when it is tightened to the running position. They prevent the belts from wrapping around the pulley when loose.

Persons under 19 years of age comprise 45% of the Soviet Union's population, compared with 32% in Great Britain, 30% in France.

Because eating spoiled food may cause animals to become ill, home economists advise burying any spoiled canned food with a tablespoonful of lye to each quart.



"It has no practical value, but it works!"

Horseless Carriages

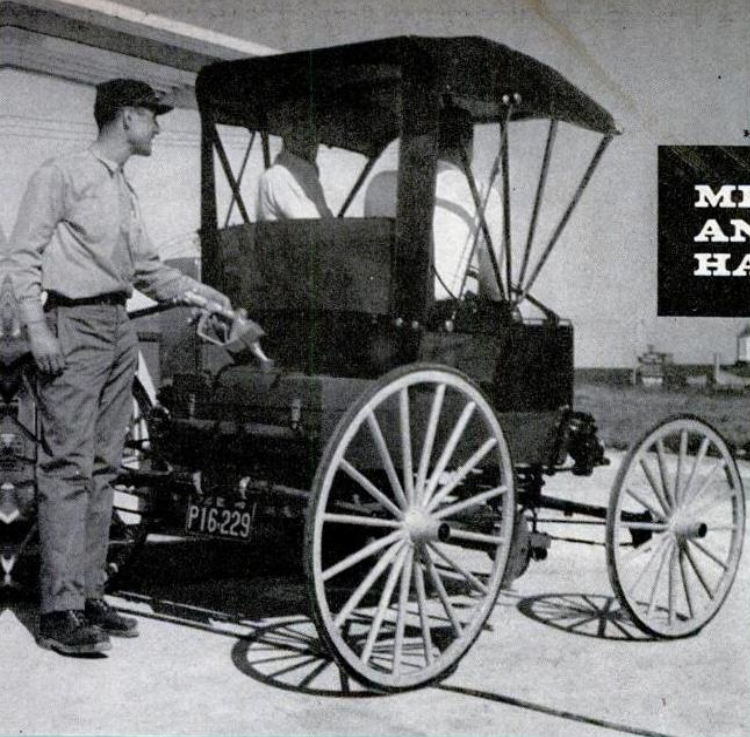
•When the automobile first came on the market there were over 600 car manufacturers in the US; majority were blacksmiths looking for a new niche – building basic cars with simple blacksmith's tools

•Today, Horseless Carriage Replicas (HRC's) are street legal after inspection and licensing under the same category as a golf cart; not legal for freeways, but good enough for side roads, highways, and neighborhoods; must be capable of 25 mph minimum, have all required safety features, and have a slow-moving vehicle emblem on the back

•A small 5 HP horizontal shaft motor is good enough for most models; chassis of welded steel with a body of wood, sheet metal, and composites; bicycle wheels negate the need for wooden wheelwrighting

•Free plans available online





MECHANICS AND HANDICRAFT

GAS IN A BUGGY?
Two gallons will fill 'er up to fire the five-hp. tractor engine. Side view below shows engine in place between the buggy rails. Turn page for details.

Antique car or modern replica? You'll have to look sharp to tell. There's a growing fad for building—

New Cars in the Old-Time Style

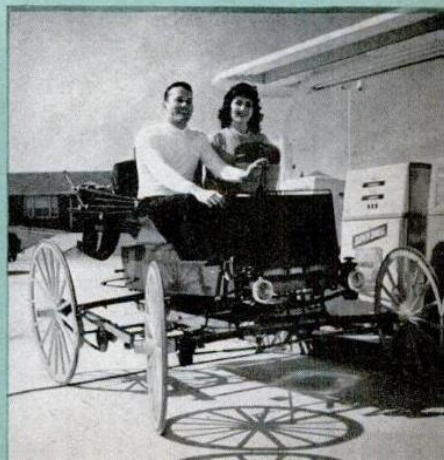
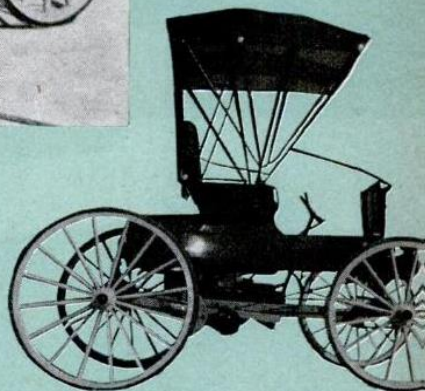
By Herbert R. Pfister

NOSTALGIC old cars are becoming more popular every day, but they're also getting scarce.

Virtually all the original old models have been dragged out of barns and restored, leaving a large and growing group of old-car enthusiasts with nothing to get enthused about.

But imagination often takes over where the law of supply and demand cannot be broken, and the old-car lovers are finding a happy substitute—*new* old cars.

Already there are three active groups of



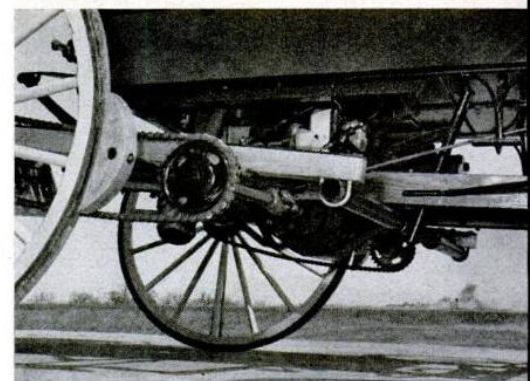
new-old-car builders: those who convert an old buggy by installing an engine; those who build cars from scratch, working from old-car plans; and the commercial builders, who operate busy factory production lines for a lucrative market.

The horseless carriage shown on this and the facing page is an excellent buggy conversion. Lyle Gilliom of St. Louis built it from an old buggy he found in a Missouri barn. Fitted out with front-wheel kingpins, a tiller bar and a five-hp. engine, the buggy kicks up a spry 15 m.p.h. on its original wheels. The wood-spoked wheels were sent to a wagon maker who cut down their diameter and added rubber tires.

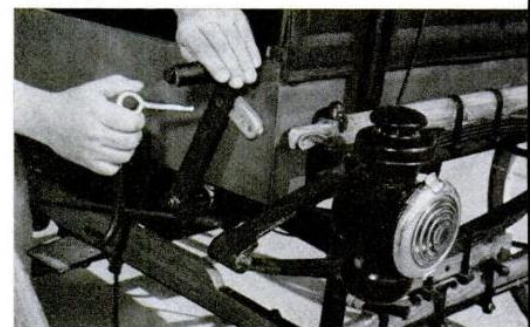
In Westfield High School, in New Jersey, Bjorne Tonneson, the woodworking-shop instructor, and Robert Della Russo, the auto-maintenance instructor, merged their classes to build an old car from scratch (see following pages). Wood-shop students fabricated the graceful plywood body and applied a hand-rubbed finish, while auto-shop students built the chassis

Before: the horseless carriage and its engine

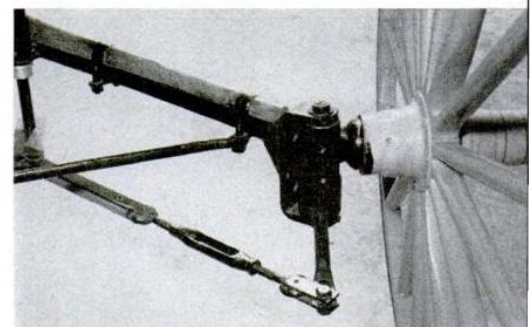
OLD PEERLESS BUGGY, built 50 years ago by the Joseph W. Moon Buggy Co. of St. Louis, is shown before conversion. The five-hp. engine of a Gravelly lawn tractor (bottom) was fitted to buggy as shown at right.



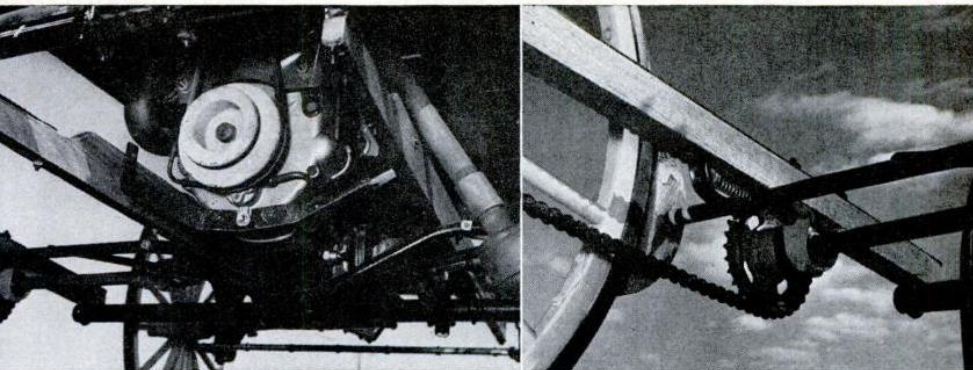
DRIVE SPROCKETS for car shown on preceding page are turned by universal joints mounted on axles that once drove tractor wheels. Ball-bearing pillow blocks bolted to oak outriggers on the chassis support the sprocket shafts.



BRAKE PEDAL is also the parking brake when depressed and pinned in position with an eyebolt stored behind the dash. Downshifting the engine's integral planetary transmission to low speed provides unusual braking effect.

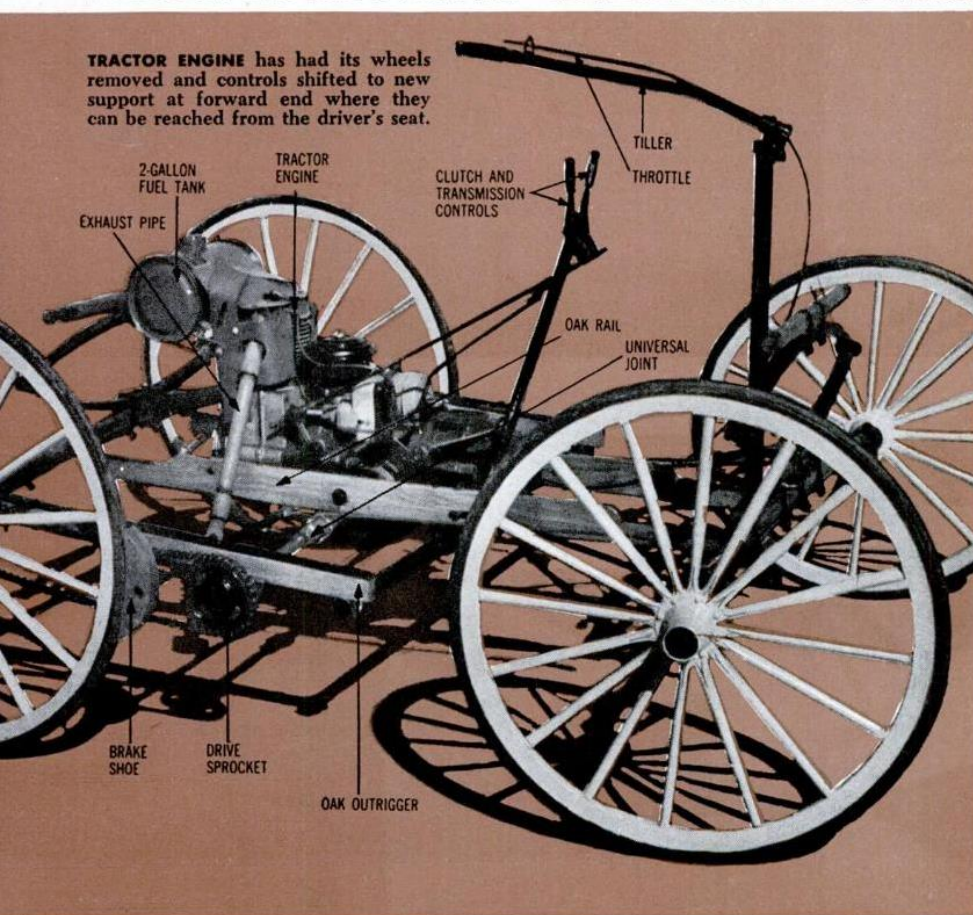


KING BOLTS were fitted to U-shaped brackets welded to the original axle. Original wheel spindle was cut off and welded to kingbolt bushing. Old central pivot was bolted together to hold the axle in a straight-ahead position.



ANGLE IRON, bent to shape and bolted between oak rails, supports rear of engine. An iron-pipe cross member supports the front. Main rails and outriggers are attached to the rear axle to keep it from shifting under strain of a hard pull.

BRAKE SHOE on each side is forced against rear wheels by stiff cross rod operated by pedal at side of body. Cross rod slides inside a door handle bolted to underside of each outrigger. Springs hold shoes off wheels when not in use.



TRACTOR ENGINE has had its wheels removed and controls shifted to new support at forward end where they can be reached from the driver's seat.

2-GALLON FUEL TANK
EXHAUST PIPE

TRACTOR ENGINE

CLUTCH AND TRANSMISSION CONTROLS

TILLER
THROTTLE

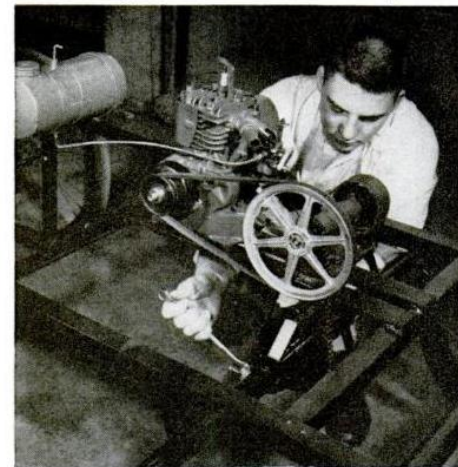
OAK RAIL

UNIVERSAL JOINT

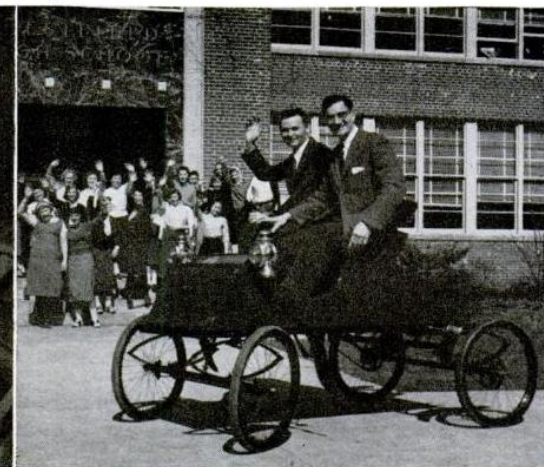
BRAKE SHOE
DRIVE SPROCKET

OAK OUTRIGGER

This car, built from scratch, won a special award



OUTSTANDING PROJECT at the New Jersey Vocational and Industrial Arts Convention in Asbury Park, the "Delton" was built entirely by high-school students. Frame is 1½" angle iron.



CENTRIFUGAL CLUTCH enables car to accelerate smoothly, and it corners nicely on turns at 15 m.p.h. Above: teachers Bjorne Tonnese and Robert Della Russo, who supervised students.

and running gears. The car, affectionately called a Delton (a combination of the names Della Russo and Tonnese), is not a copy of any particular old vehicle. Plans were drawn by the school's mechanical-drawing class.

The Delton's chassis is a simple frame of 1½" angle iron. A Mercury centrifugal clutch mounted on the shaft of a little two-hp. engine engages automatically as engine speed is increased. Power is transmitted by belt to a pulley on a countershaft, then by sprocket and chain to the drive shaft. A bevel-gear differential permits a sprocket on each end of the

drive shaft to power rear wheels individually.

Ordinary 26" bicycle wheels were used on the car after removing the small-bore bearing races and turning duplicates to fit the ¾" axle shafts. A 4" steel disk was brazed to the inside of each rear-wheel hub and a standard 9" bicycle sprocket was bolted to each disk to drive the wheels.

Steering stability was built in by tilting back the front axle for caster. Welding the kingbolt bushing slightly off plumb provided camber. Adjustable clevis ends on tie rods set toe-in.

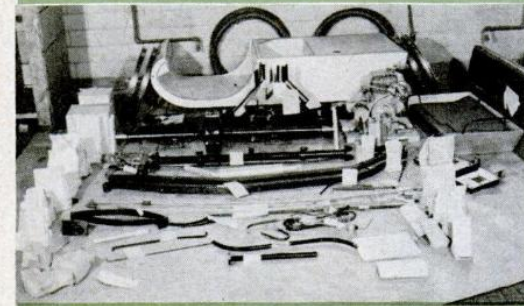
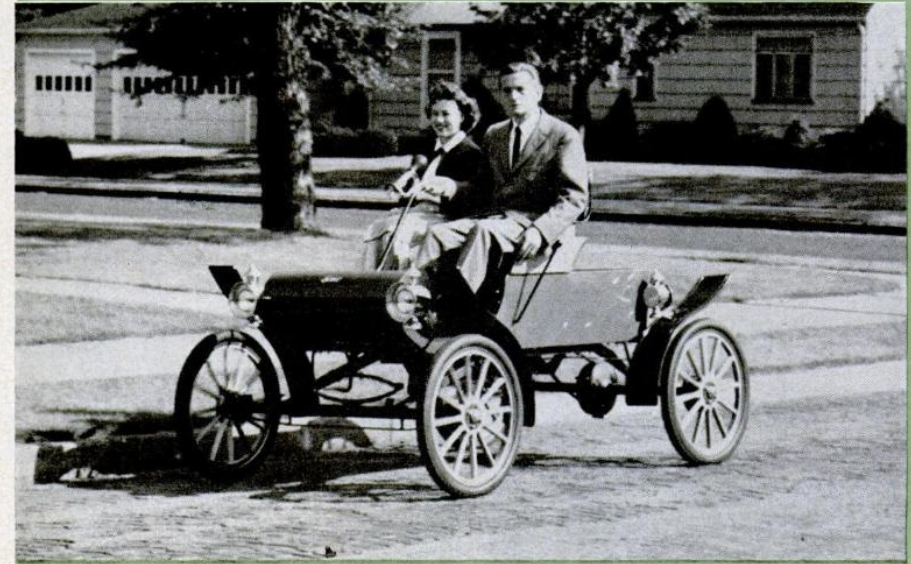


To Get Complete Car Plans

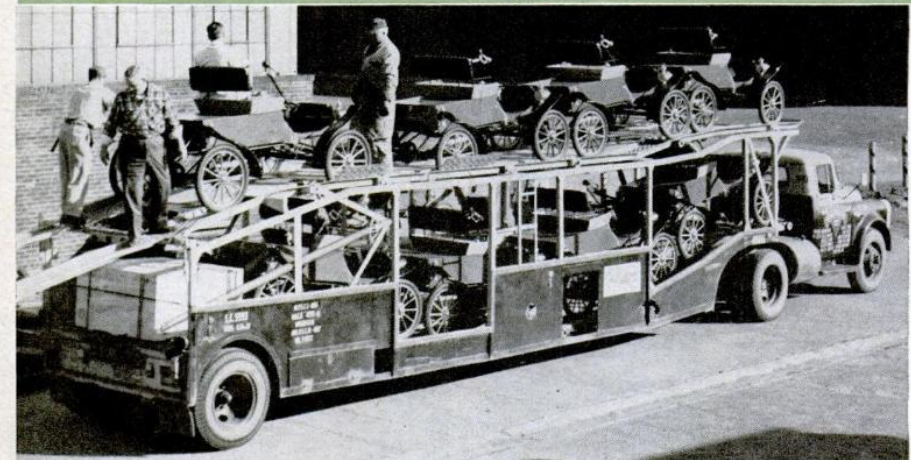
LIKE to build this car? The drawing on the opposite page provides enough general information on parts and assembly so that you can build one like it. But for exact details and dimensions of every part you'll have to make, plus step-by-step assembly instructions, you may want a blueprint. How do you get one?

Send \$1 to: OLD CAR PLANS
Popular Science Monthly
355 Lexington Ave.
New York 17, N.Y.

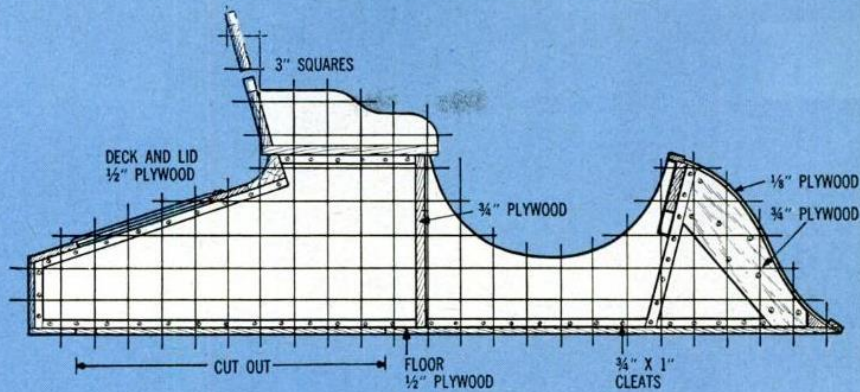
The easy way to own an "antique": Buy one of these



NEW-OLD-CAR PRICES begin at \$1,100 for the do-it-yourself Surrey kit shown at left. The ready-to-run Surrey above costs \$1,295. Either can be ordered from Dyer Products Co., 514 Second St., S.W., Canton 1, Ohio. The car features an eight-hp. engine, electric starter, all-steel body, two-wheel brakes and sealed-beam headlights. Eight Surreys, and a kit, loaded on a modern carrier truck (below) make an unusual sight.



130 POPULAR SCIENCE

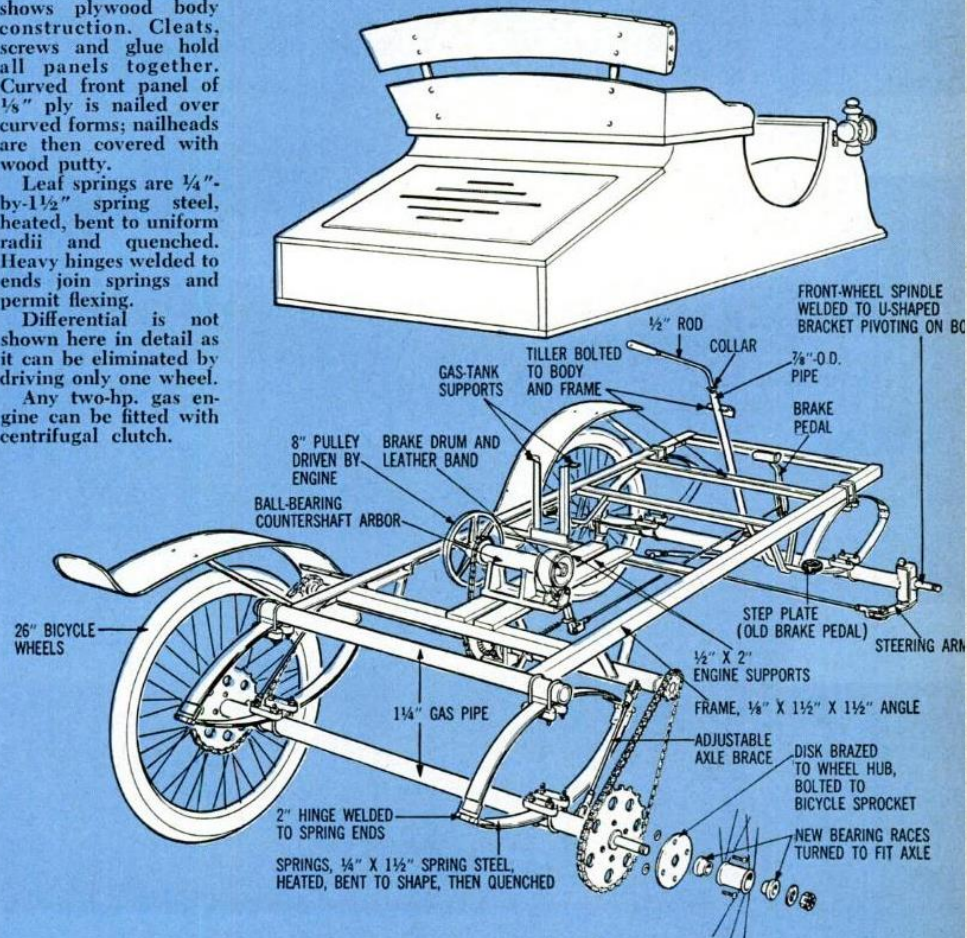


CUTAWAY OF DELTON shows plywood body construction. Cleats, screws and glue hold all panels together. Curved front panel of 1/8" ply is nailed over curved forms; nailheads are then covered with wood putty.

Leaf springs are 1/4"-by-1 1/2" spring steel, heated, bent to uniform radii and quenched. Heavy hinges welded to ends join springs and permit flexing.

Differential is not shown here in detail as it can be eliminated by driving only one wheel.

Any two-hp. gas engine can be fitted with centrifugal clutch.



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spanking-new ancients now being manufactured again



MERRY OLDS (left) is an authentic reproduction of the 1901 Olds. Priced at \$1,495, it's sold by Old Time Autos, 1270 Avenue of the Americas, NYC 20. It has a four-hp. engine, lights, brakes, wood body.



ROLLSMOBILE (right), a 3/4-scale reproduction of 1901 Olds, has a three-hp. engine. Starts Mfg. Co., Fort Lauderdale, Fla., will fly one anywhere in the U. S. for \$1,195. All cars shown on these pages have a top speed of 30 to 35 m.p.h.

Tips on Building Old Cars

BRAKES present the most difficult problem—new-old cars with jury-rigged two-wheel brakes are refused a license in many states. Whether you build or buy your car, better check licensing requirements with your motor vehicle bureau. Otherwise you might end up with a car that can be driven only in parades or on private property. Crosley brake drums or Chrysler drive-shaft parking brakes often can be adapted to old-car rear wheels.

Bicycle wheels are okay for a light car, but sulky wheels—the kind you see at trotting races—are sturdier.

Your transmission and clutch can be as simple as a one-speed drive set in motion by tightening an idler pulley on a loose, slipping V belt.

Realistic and effective headlights can be made by installing sealed beams—the type used in campers' lanterns—in old railroad lanterns. You might fabricate antique headlamps from metal lamp bases, light-fixture parts or tin cans.

One final caution: Your old car may have a full-throttle speed of 35 m.p.h., probably less, so even if you get it licensed, stick to the side roads—you'll be a nuisance on the highway. **END**

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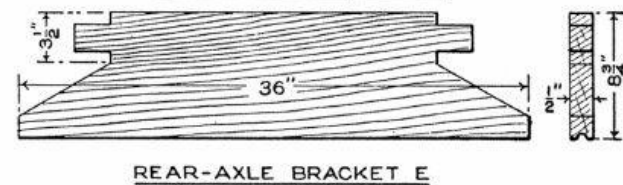
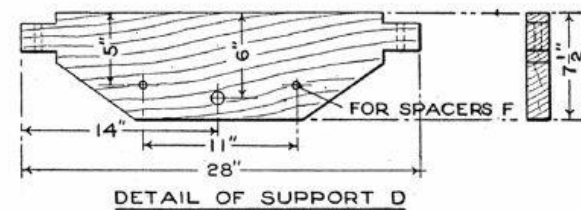
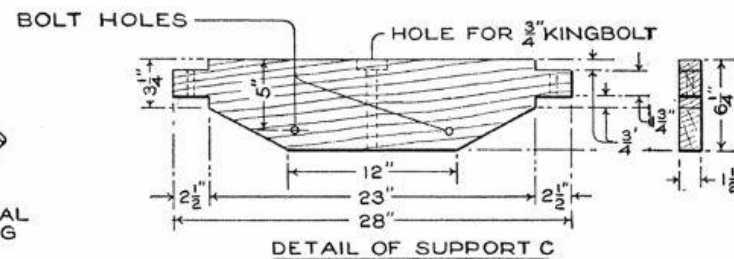
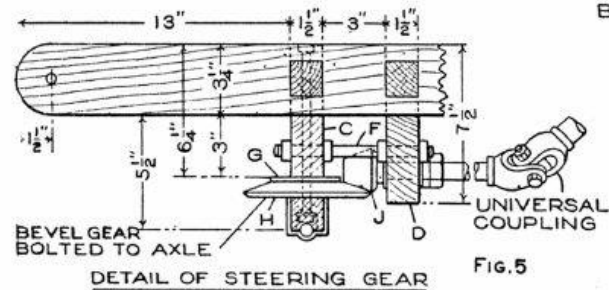
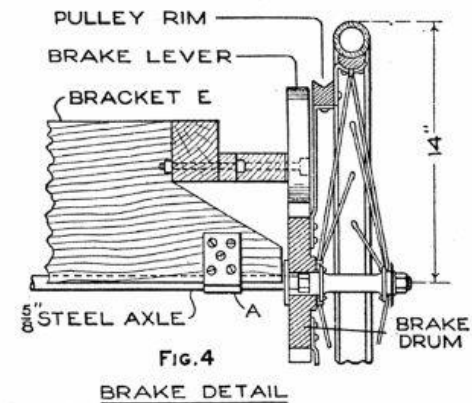
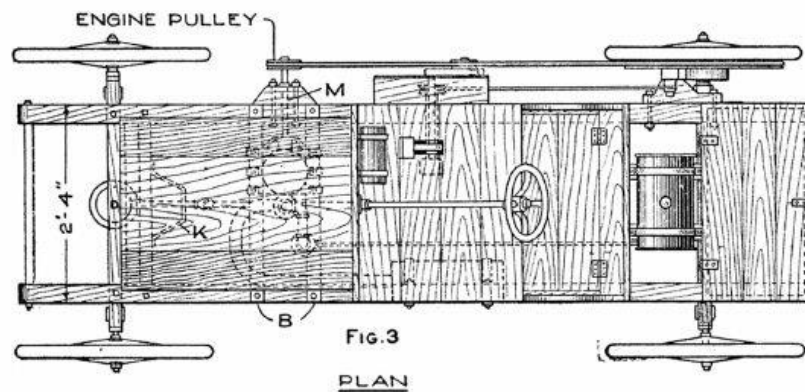
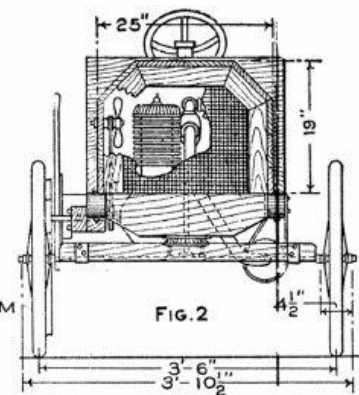
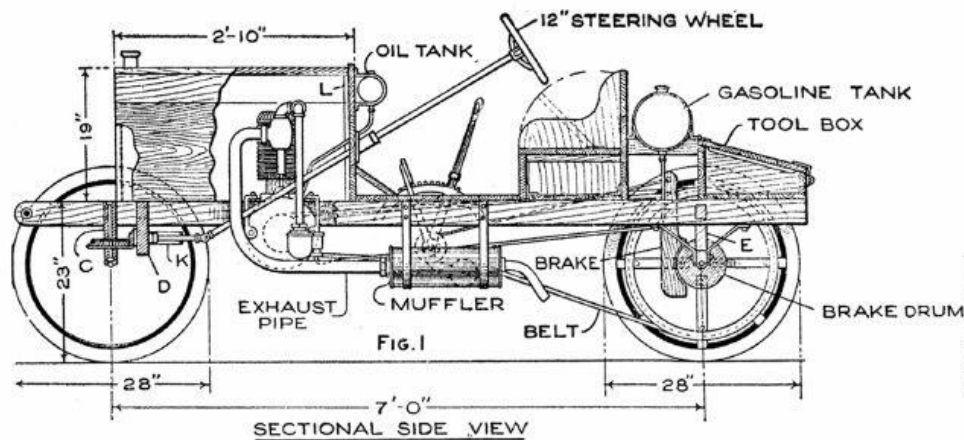
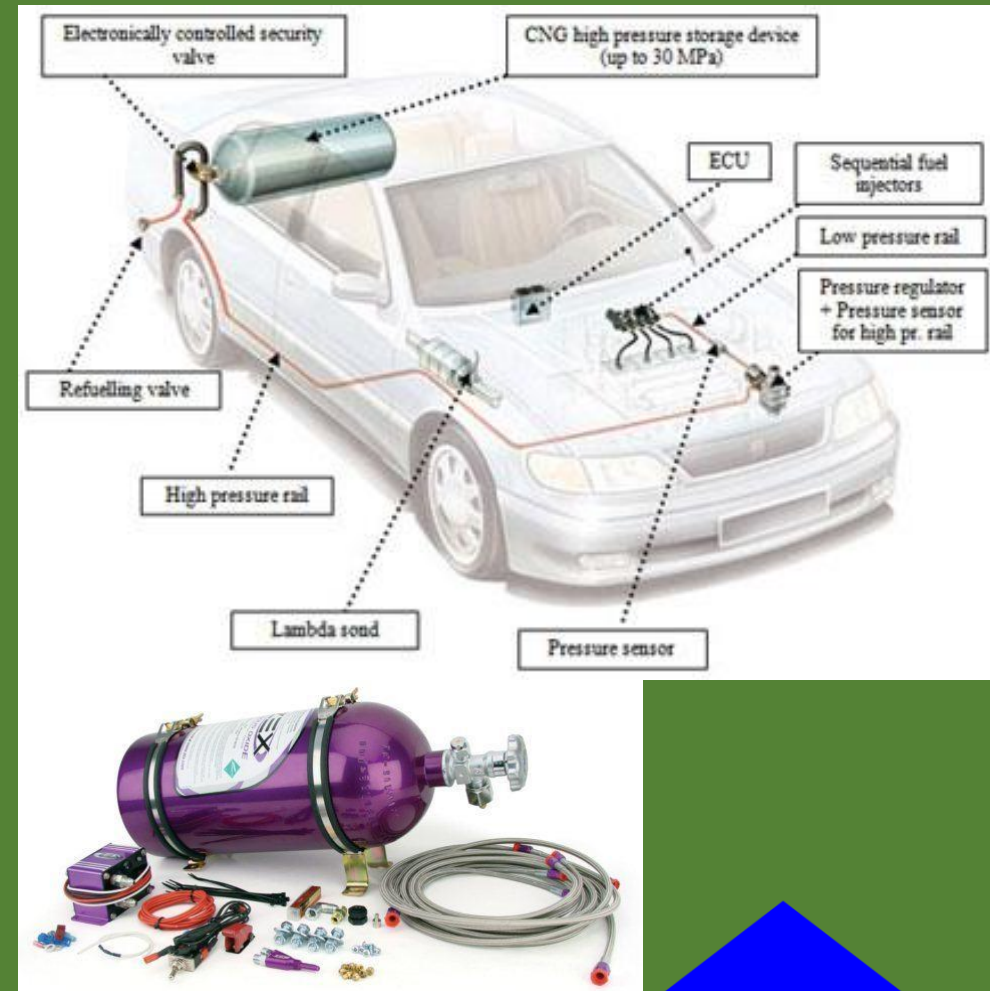


FIG. 6

Converting your Car to Natural Gas

- Gasoline prices being as unstable as they are, an alternative is compressed methane
- Cars today do not require sole conversion but can be dual fueled – switching between gasoline and methane; kits come with detailed instructions on installation and maintenance, or a local body shop can do the install for a fee
- Natural gas made at home from livestock waste works just as good as product from the gas company; the homemade gas requires filtering and compression; from there it goes directly into the car
- Conversion kits are available for two-stroke and small engines, also



CNG

Exercising

- Part of the Lord's self-reliance plan is for us to care for our bodies – feeding and building are only part of the larger plan
- There are numerous types of exercises that are helpful; study and test a variety and create a combination of these exercises to help you maintain a healthy, productive body
- 30 minutes to one hour every other day is optimal

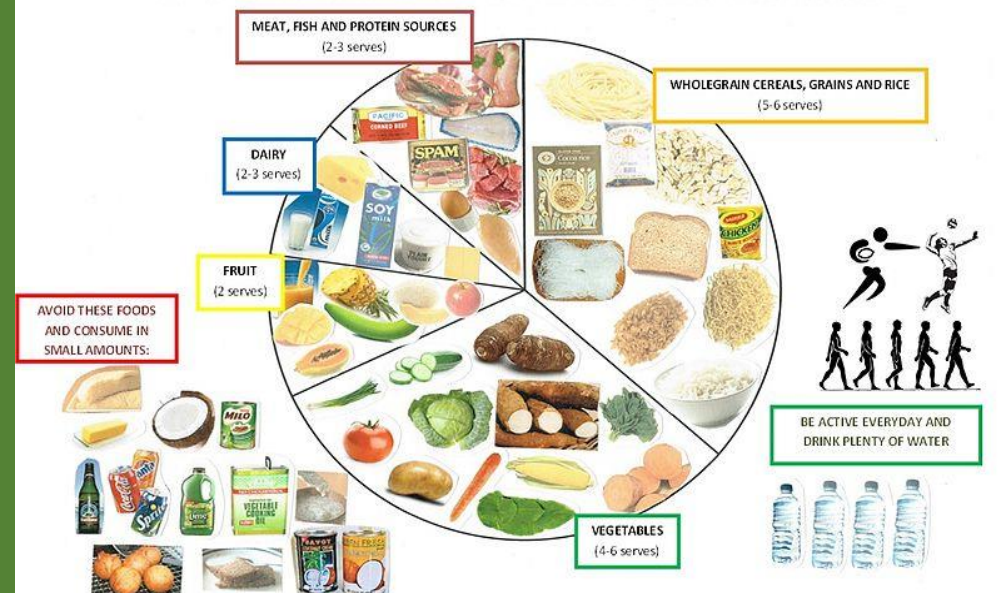


Nutrition

- The heart of any fitness plan is great nutrition
- The idea of great nutrition is to consume food combinations that create complete proteins, complex carbohydrates, and trace vitamins and minerals, plus a cheat day
- Cheat days are days where higher calories and sweets are consumed; keeping on a fat burning diet can stress the body and emotions, so having a cheat day is a reward plus brings in more calories to keep the body from thinking it's in a starvation mode
- A weightlifters diet consists of higher protein and lower calories with a cheat day worked in; when starting this diet, have your cheat day once a week and push out farther on your timetable; this diet does allow complex carbohydrates and fruits; this is eaten in small meals and moderate snacks throughout the day to keep blood sugars low and steady – burning fat and maintaining nutrients
- Do not sacrifice flavor for perceived nutrition; the old Utah cuisine ideal of “plain, but wholesome” can be changed to “Wholesome and refined”
- Keep hydrated while doing any physical activity



FOOD GUIDE FOR HEALTHY EATING





FOOD CHART



GROUP 1

BODY BUILDING FOODS

Build the body and prevent the tissues from wasting away.



- MILK
- CHEESE
- EGGS
- MEAT
- FISH

Many vegetable foods such as peas and beans, bread and potatoes, help in body-building, but they are not such good body-builders as those first.



GROUP 2

ENERGY FOODS

provide fuel for the body

- POTATOES
- BREAD
- FLOUR
- OATMEAL
- RICE
- SAGO
- SUGAR
- DRIED FRUIT
- HONEY
- CHEESE
- BUTTER
- MARGARINE
- DRIPPING
- SUET
- LARD
- BACON
- HAM



GROUP 3

GROUP 4



PROTECTIVE FOODS

give protection from illness

- MILK
- BUTTER
- MARGARINE
- CHEESE
- EGGS
- HERRINGS *(fresh, canned or salt)*
- SALMON *(fresh or canned)*
- LIVER



Preservative foods are needed for proper nourishment. They build the neck and bones and help the body to resist infection.



- POTATOES
- CARROTS
- FRUIT *(fresh or canned, but not dried)*
- GREEN VEGETABLES *(fresh or canned, but not dried)*
- SALADS
- TOMATOES
- WHOLEMEAL BREAD - BROWN BREAD



EAT SOMETHING FROM EACH GROUP EVERY DAY

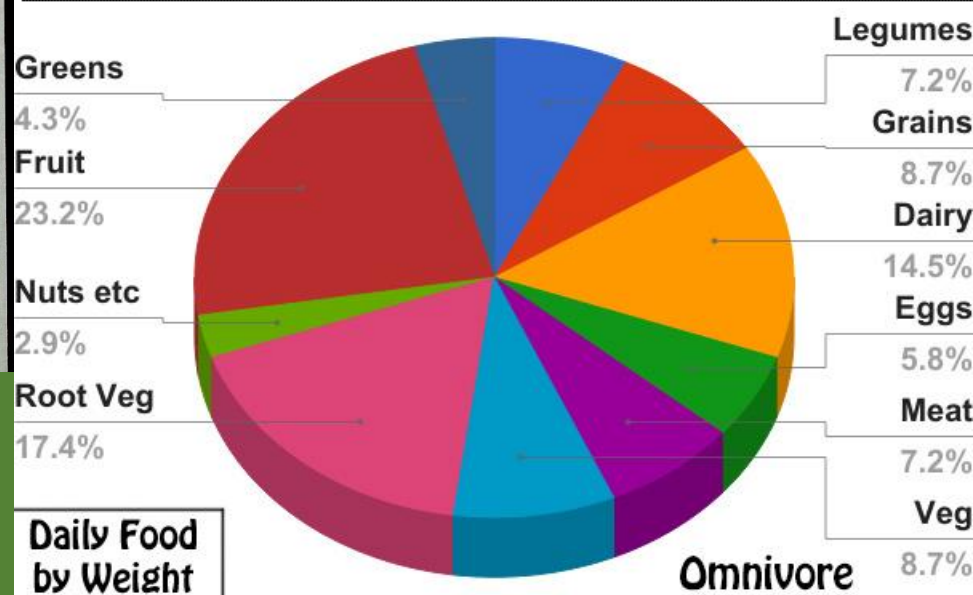
FOODS AT THE HOSPITAL AT NILES



ILLUSTRATED FOR THE HOSPITAL AT NILES BY MISS MARGARET A. TOL, 1710 LAMARCA, N.Y. 11401

Proteins Women 6-8 oz, Men- 8-10 oz or palm of your hand is a good rule for protein portion size. Red meat only 3x per week. Stick to leaner sources for the majority.	Complex Carbs Serving size is normally ½ cup for women and 1 cup for men. (the size of your fist is a good portion size if you rather eye ball it that way)	Complex Carbs {Vegetables} (Pick Fresh first, frozen second, canned last choice) 2 cupped hands full is a good portion size. Choose veggies at every meal that you possibly can!	Complex Carbs {Fruit} 1 fruit or ½ to 1 cup serving. Fruits do have a lot of natural sugar but are really great for you. It's best to eat more veggies than fruit.
*Boneless, Skinless Chicken Breast *Tuna (water packed), or White Meat Chicken (water packed) *Fish-wild caught, not farm raised (tilapia, trout, cod, halibut, hake or any white fish and on occasion salmon and sea bass) *Shrimp *Extra Lean Ground Beef, grass fed is best (96% or leaner) *Lean Beef- Roast, steaks *Buffalo or Bison steak (lean) *Protein Powder *Eggs *Lean Ground turkey, Turkey Breast Slices or cutlets *Turkey Sausage *Turkey Bacon *Aidelles Chicken/apple sausage & Apple Gate Farm (use fresh meat as main source not deli cuts they have a lot of fillers)	*Oatmeal (steel cut or old fashioned is best)(gluten free options also available) *Sweet Potatoes (Yams) *Beans (pinto, black, kidney)(if choose canned, low sodium is best) *Oat Bran Cereal (watch sugar, less than 6 grams) *Ezekiel Bread (frozen healthy section of Kroger's or Whole Foods) *Multigrain Hot Cereal *Pasta (whole wheat or gluten free option) *Rice (basmati, wild, brown) *Potatoes (red, baking, new) *Whole Wheat Pita (or Ezekiel pita) *Corn Tortillas (Food for Life Brand is best) *Ezekiel or Whole Wheat Tortillas (Food for Life brand) *Quinoa *Couscous *Buckwheat (white rice or white potatoes will only be acceptable if its post workout food)	*Green Leafy Lettuce (Green Leaf, Red, Leaf, Romaine)/Bagged Salad *Broccoli *Asparagus *Artichoke *String Beans *Spinach *Bell Peppers *Brussels Sprouts *Cauliflower *Celery *Mushrooms *Pickles *Rice (basmati, wild, brown) *Sprouts *Cucumber *Green or Red Pepper *Onions *Garlic *Tomatoes *Zucchini *Spaghetti Squash *Pumpkin	*Berries (blueberries, raspberries strawberries, blackberries) *Lemons or Limes *Melons *Grapefruit *Apples *Grapes *Oranges *Pears *Banana *Peaches *Plums *Pineapple *Mango And more... *Limit dried fruits, including raisins (loaded with sugar, so use sparingly)
Healthy Fats (handful of nuts or 1-2 TBS is good serving size) *Natural or Organic Peanut Butter and Almond butter *Olive Oil or Safflower Oil *Nuts (peanuts, almonds, walnuts, pistaccios, cashews, etc) (try to limit these to 1X per day) *coconut flour/almond flour *Flaxseed Oil *Avocado or avocado oil *Coconut/ Coconut oil *Olives *Chia seed *Grass fed Butter or Ghee	Dairy (Eat dairy only occasionally if you want big results or none at all if you have a problem with dairy) *Cottage cheese *Milk (raw is best) *Yogurt (look for low sugar & higher protein) *Greek yogurt (can add fruit and stevia, cinnamon or even protein powder to it)	Beverages *Unsweetened Almond milk or coconut milk *Pure Coconut water *Bottled Water, sparkling water *Tea, Kombucha *Organic whole milk or raw milk	Condiments & Misc. (1-2 TBS is normally a serving size) *Ketchup (Heinz One Carb brand or low sugar varieties of sauces, watch portions) *Reduced Sodium Soy Sauce or Coconut Aminos/liquid aminos *Balsamic Vinegar *Salsa *Tomato Sauce/Paste *Mustard (yellow or Dijon) *Sugar free maple syrup, use sparingly *Honey/Pure maple syrup, use sparingly *Vinegar- White, rice or apple cider and balsamic vinegar *Questbar *Think Thin Bar *Square bar *Plain Rice Cakes *Air popped popcorn *You Fresh Naturals Cocoa Nut butter or similar natural spread *Dark Chocolate 70% or higher or "Enjoy" chocolate chips
Spices Use all kinds without sugar To flavor your food.	Clean Eating Foods by Angela Shaner		

Table I Factor structure (principal axes with varimax rotation) and explained variance of the FCI-SP in the patient group and the student group						
Item	Patients			Students		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Cake	0.816	0.317	0.082	0.664	0.092	0.225
Pizza	0.261	0.287	0.493	0.337	0.242	0.546
Fried Chicken	0.213	0.581	0.192	0.183	0.547	0.217
Sausage	0.151	0.123	0.493	0.249	0.400	0.488
French Fries	0.379	0.603	0.342	0.243	0.495	0.234
Rice	0.189	0.741	0.169	0.107	0.697	0.050
Hot dog	0.260	0.229	0.681	0.123	0.050	0.718
Hazelnut spread	0.608	0.054	0.301	0.454	0.021	0.394
Hamburger	0.687	0.412	0.766	0.122	0.186	0.694
Biscuits	0.549	0.092	0.482	0.481	0.228	0.233
Ice cream	0.585	0.461	0.181	0.660	0.154	0.154
Pasta	0.209	0.635	0.297	0.111	0.534	0.167
Fried fish	0.207	0.719	0.175	0.268	0.468	0.181
Cookies	0.634	0.216	0.201	0.551	0.292	0.156
Chocolate	0.741	0.141	0.167	0.641	0.101	0.140
Pancakes	0.510	0.186	0.105	0.625	0.179	0.101
Rolls	0.364	0.515	0.276	0.229	0.484	0.179
Donuts	0.648	0.309	0.227	0.580	0.119	0.234
Candies	0.509	0.382	0.107	0.456	0.298	0.147
Brownies	0.606	0.178	0.248	0.696	0.073	0.149
Bacon	0.289	0.088	0.485	0.245	0.217	0.467
Croissant	0.450	0.202	0.149	0.644	0.195	0.174
Steak	0.103	0.692	0.217	0.084	0.720	0.278
Pie	0.685	0.249	0.066	0.667	0.177	0.122
Baked potatoes	0.122	0.629	0.011	0.038	0.504	0.128
Barbecued foods	0.150	0.046	0.554	0.176	0.017	0.510
Mashed potatoes	0.437	0.579	0.193	0.003	0.458	0.138
Bagel	0.562	0.318	0.466	0.455	0.144	0.337
Explained variance	21.17	20.38	10.23	20.13	18.19	9.99
Accumulated variance	21.17	41.55	51.78	20.13	38.32	48.31



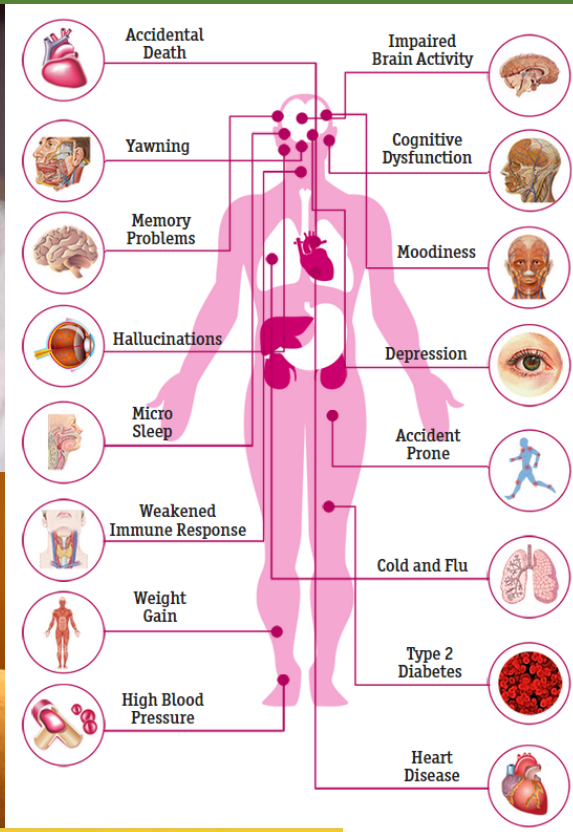
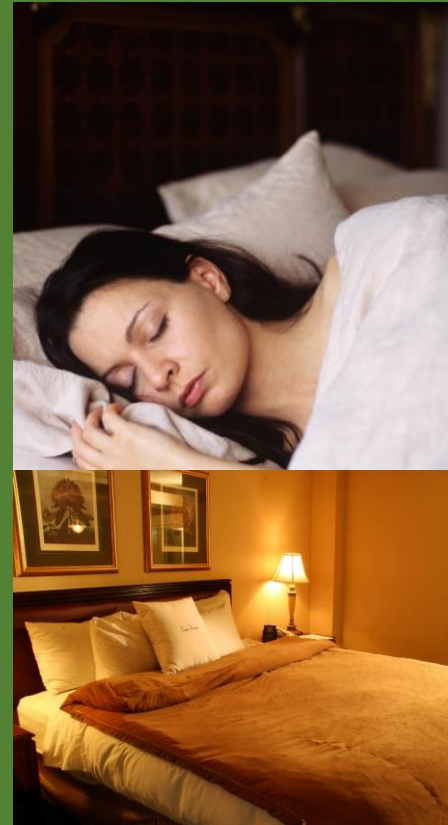
Complete Proteins

- Complete proteins come from mixing a high protein source with a low protein source (i.e.: rice and beans, steak and veg)
- Expensive protein shakes are not necessary as the expensive brands are made for professional competitive bodybuilders; for everyday fitness use simple meats, beans, legumes, nuts, dairy, eggs, basic whey shakes, breakfast shakes, protein bars, and nutritional supplements
- Eat a variety and try new things; also avoid intense vegetarianism and veganism as it will deprive the body of nutrients
- Golden time: After any moderate to high impact exercise you'll need to consume some protein within 30 minutes; this will help your body build up muscles



Sleep

- Restful sleep is necessary for building muscles, keeping the body at homeostasis, resting organs and systems, and converting short-term memory to long-term
- Sleep deprivation leads to horrible effects for both body and spirit - including death; insomnia is a severe medical condition where a person cannot sleep due to several factors
- To aid in sleep: make your bedroom a place for sleep only – remove phones, TV, and other visual distractions; be sure your bed is comfortable and large enough; adjust bedroom temperature for your ideal
- No amount of exercise and training will make up for a lack of sleep; if suffering from insomnia, night terrors, or chronic nightmares contact your primary care physician for help before starting an exercise program



How Much Sleep Do You Really Need?	
Age	Sleep Needs
Newborns (0-2 months)	12-18 hours
Infants (3 to 11 months)	14 to 15 hours
Toddlers (1-3 years)	12 to 14 hours
Preschoolers (3-5 years)	11 to 13 hours
School-age children (5-10 years)	10 to 11 hours
Teens (10-17)	8.5-9.25 hours
Adults	7-9 hours

Source: National Sleep Foundation

Exercise Varieties

- Exercises vary from High to moderate to low impact; the level you work at is determined by your current physical limitations and your goals
- A basic combination to begin with could be weightlifting, cardio, and gardening
- Disability is not necessarily a barrier to exercising; increasing activity has positive results with physical, mental, and emotional disabilities and handicaps; always have assistance nearby
- Don't take on too much activity at once; gradually build up



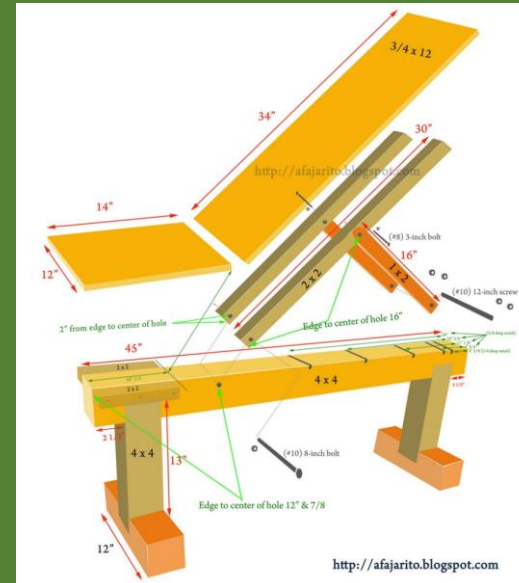
Dynamic Stretches

- Traditional stretching before activity is no longer advised as it can do more damage; stretches are excellent for stiff muscles, cramps, orthopedic recovery, and balance
- Instead of just pulling on muscles and ligaments to stretch them, incorporate rotational movements with the stretches; this warms up and loosens the muscles and ligaments for activity far better than just stretching



Weightlifting




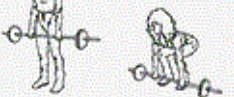




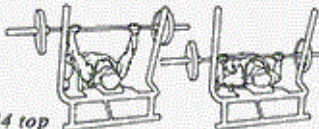
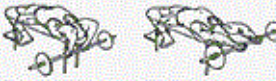
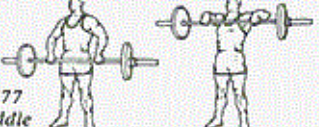
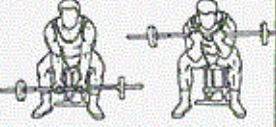




- There are two methods to weightlifting: muscle building and muscle maintenance
- Muscle building is using appropriately heavy weights to create microscopic tears in the targeted muscles, which protein consumption would fill in
- Muscle maintenance uses lighter weights to build stamina instead of bulk
- Free weights are the most efficient means to build muscles; however machines are good when free weights are not available, or if you have mobility problems and injuries
- Weightlifting can increase your heart rate if done vigorously – consult your primary care doctor before starting



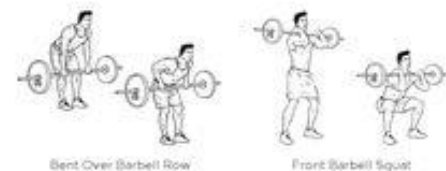
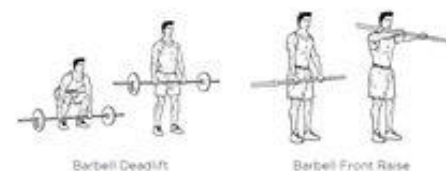
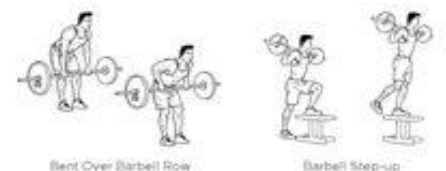
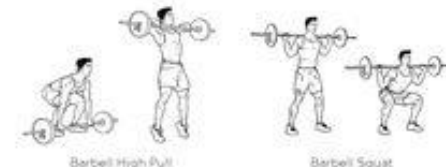
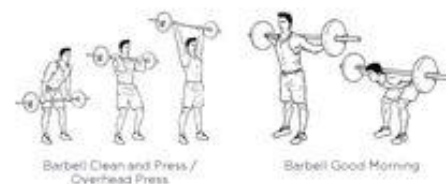
Home Gym Barbell Training Program

One plate-loading barbell with a selection of plates and a flat bench are the only pieces of equipment needed for this program. Use enough weight so that the last rep of each exercise is fairly difficult. Perform the exercises in the order shown. Do 1, 2 or 3 sets of each exercise, depending on how long and hard a workout you want.

Days per week: M-W-F or T-Th-Sat.

exercises	sets	reps	exercises	sets	reps
1  p.191 top	1	10 to 25	9  p.205 top	1-3	10 to 12 per set
2  p.190 middle	1	15 to 50	10  p.206 middle	1-3	10 to 12 per set
3  p.193 bottom	1	15 to 30 ea. side	11  p.304 top	1-3	10 to 12 per set
4  p.197 middle	1	10 to 50	12  p.225 middle	1-3	10 to 12 per set
5  p.244 top	1-3	10 to 12 per set	13  p.305 top	1-3	10 to 12 per set
6  p.277 middle	1-3	10 to 12 per set	14  p.226 bottom	1-3	10 to 12 per set
7  p.251 bottom	1-3	10 to 12 per set	15  p.287 bottom	1-3	10 to 12 per set
8  p.279 bottom	1-3	10 to 12 per set	16  p.290 top	1-3	10 to 12 per set each leg

PRINTABLE WORKOUT Barbell exercises

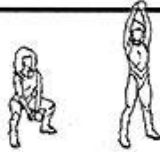
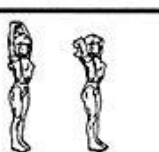


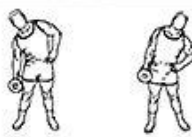





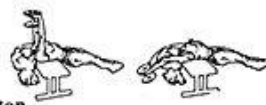
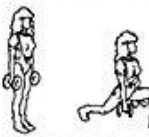






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Home Gym Dumbbell Training Program

Two plate-loading dumbbells with a selection of plates and a flat bench are the only pieces of equipment needed for this training program. Use enough weight so that the last rep of each exercise is fairly difficult. Perform the exercises in the order shown. Do 1, 2 or 3 sets of each exercise, depending on how long and hard a workout you want.

Days per week: M-W-F or T-Th-Sat.

exercises	sets	reps	exercises	sets	reps
1  p. 193 middle	1	10 to 15	9  p. 300 top	1-3	10 to 12 per set
2  p. 190 top	1	15 to 50	10  p. 302 bottom	1-3	10 to 12 per set
3  p. 191 bottom	1	15 to 50 ea. side	11  p. 218 middle	1-3	10 to 12 per set
4  p. 196 bottom	1	15 to 50	12  p. 218 top	1-3	10 to 12 per set
5  p. 248 top	1-3	10 to 12 per set	13  p. 258 top	1-3	15 to 20 per set
6  p. 250 top	1-3	10 to 12 per set	14  p. 290 bottom	1-3	10 per set ea. leg
7  p. 204 middle	1-3	10 to 12 per set	15  p. 290 middle	1-3	10 per set ea. leg
8  p. 275 bottom	1-3	10 to 12 per set	16  p. 236 middle	1-3	15 to 20 per set ea. leg

Bodyweight Exercises

BY NEILA REY @neilarey.com



abs



quads



glutes



triceps



biceps



back



chest



sit-ups



lunges



squats



close grip push-ups



leg curls



pull-ups



push-ups



reverse crunches



high knees



donkey kicks



tricep dips



chin-ups



elbow lifts



plank rotations



bicycle crunches



turning kicks



bridges



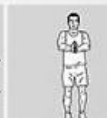
tricep extensions



doorframe rows



superman



chest squeezes



flutter kicks



climbers



jump knee tucks



get-ups



body rows



star plank



shoulder press



leg raises



plank jump-ins



fly steps



punches



sitting pull-ups



alt arm/leg plank



shoulder taps



elbow plank



lunges step-ups



side leg raises



side-to-side chops



pseudo planche



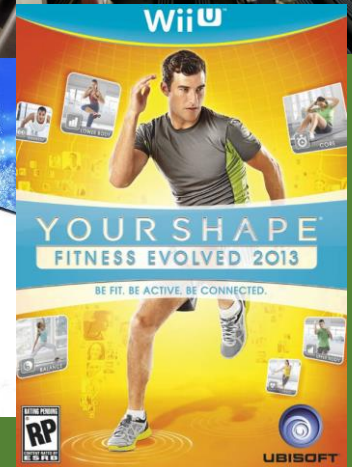
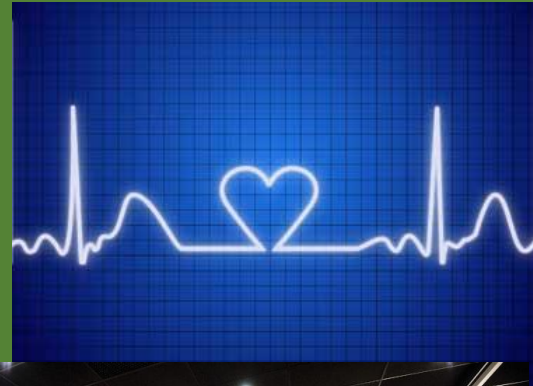
full arch



clapping push-ups

Cardio

- The goal for cardio is 135 – 175 heartbeats per minute
- There is a lively debate in health circles as to whether cardio ruins your weightlifting gains by burning muscle with the fat; this debate is not settled as research is still ongoing, and incorporating both in whatever ratio your goals calls for is acceptable
- Jogging, cycling, competitive swimming, sports, and other activities count so long as you get your heart rate up
- Some video game systems support cardio games; Your Shape games and Just Dance work well, but Wii Fit has difficulty helping you keep up your heart rate












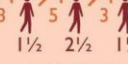
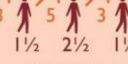
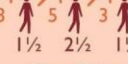
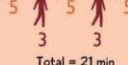


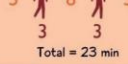
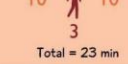










Couch to 5k with Emi



I heard you want to start running and get in shape!
That's great!
If you haven't been running for a while then it is best to start with an easier running routine.
Follow this guide, keep to it, and in a few weeks you'll be able to run longer and faster!



To boost your endurance, alternate a few minutes of jogging and walking, each week jogging a little more. Rest a few days in between workouts.

	day 1	day 2	day 3
week 1	 $\times 8$ Total = 20 min	 $\times 8$ Total = 20 min	 $\times 8$ Total = 20 min
week 2	 $\times 6$ Total = 21 min	 $\times 6$ Total = 21 min	 $\times 6$ Total = 21 min
week 3	 $\times 2$ Total = 18 min	 $\times 2$ Total = 18 min	 $\times 2$ Total = 18 min
week 4	 $\times 5$ Total = 21 1/2 min	 $\times 5$ Total = 21 1/2 min	 $\times 5$ Total = 21 1/2 min
week 5	 $\times 3$ Total = 21 min	 $\times 3$ Total = 21 min	 $\times 3$ Total = 21 min
week 6	 $\times 3$ Total = 23 min	 $\times 3$ Total = 23 min	 $\times 3$ Total = 23 min
week 7	 Total = 25 min	 Total = 25 min	 Total = 28 min
week 8	 Total = 28 min	 Total = 28 min	 Total = 30 min
week 9	 Total = 30 min	 Total = 30 min	 Total = 30 min



One of the best things you can do is get a running partner, but even if you can't find one, just remember all of your friends online that are getting fit and running now, too!

Don't let them down!

And anytime you want to see me, you know I'll be running around the track at Yamaku every morning if you want to come visit me.

I'll be cheering for you!

Bridge to 10K with Emi



I heard you've been running for a while now, and want to take the next step. That's amazing! And some very clever wordplay, if I do say so myself!

If you haven't been running for a while, then it's best to start with an easier running routine. Look online for my "Couch to 5K" guide!

Follow this guide, keep to it, and in a few weeks you'll be able to run longer and faster than ever!



To boost your endurance, alternate a few minutes of jogging and walking, each week jogging a little more. Rest a few days in between workouts. Warm up by walking briskly for 5 minutes, and do a 5 minute cool down walk after running.

	day 1	day 2	day 2
week 1	 $\times 4$ Total = 53 min	 $\times 4$ Total = 53 min	 $\times 4$ Total = 53 min
week 2	 $\times 3$ Total = 57 min	 $\times 3$ Total = 57 min	 $\times 3$ Total = 57 min
week 3	 $\times 3$ Total = 63 min	 $\times 3$ Total = 63 min	 $\times 3$ Total = 63 min
week 4	 $\times 3$ Total = 66 min	 $\times 3$ Total = 66 min	 $\times 3$ Total = 66 min
week 5	 $\times 2$ Total = 55 min	 $\times 2$ Total = 61 min	 $\times 2$ Total = 71 min
week 6	 Total = 70 min	 Total = 70 min	 Total = 70 min



One of the best things you can do is get a running partner, but even if you can't find one, just remember all of your friends online that are getting fit and running now, too!

If you've come this far, you haven't let them down yet! So keep it up!

And anytime you want to see me, you know I'll be running around the track at Yamaku every morning if you want to come visit me.

I'll be cheering for you!

Emi Version 2.0b
Original credit to the book *Show Me How* 1999

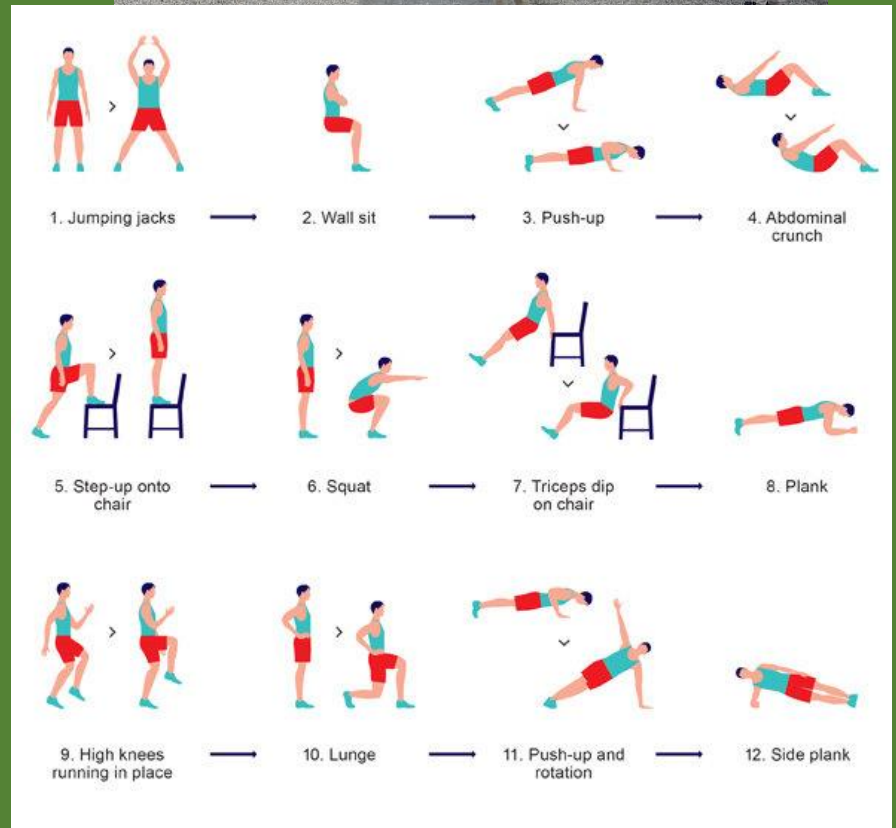
stretching

-these stretches are for running
-stretch before and after your run
-hold each stretch for 12 seconds (unless otherwise specified)



Calisthenics

- Calisthenics uses a variety of gross motor movements, minimal equipment, and incorporates all forms of exercises to increase muscle endurance, some bodybuilding, and better health
- Most calisthenics use the body's own weight/mass as the resistance
- Adding yoga movements to calisthenics improves your workout exponentially





Mountain



hands to heart



Chair Pose



Forward Fold



Halfway Lift



Forward Fold



Padangustasana



Halfway Lift



Plank



Locust



Locust w/ Chest Expansion



Plank



Down Dog



Leg High

3



Lunge



Crescent Moon



Half Splits



Warrior 2



Extended Side Angle



Reverse Warrior



Chaturanga



Up Dog



Down Dog



Mountain Pose



Sports

- The Church has historically encouraged sports teams in Wards and Stakes; back in the 1960's some Wards even called YW as cheerleaders; today these teams are gone, but that doesn't mean sports are out of the lives of the Saints
- Adding weightlifting, cardio, and other exercises will help performance



Active Rest vs Passive Rest

- Active rest uses very low impact aerobics and cardio to boost body functions; when doing moderate to high impact exercises followed by passive rest, the body becomes exhausted from the two extremes
- Slow jogging at a near walking pace, a few sessions of dynamic stretches, casual swimming are all examples of active rest
- Passive rest is laying down, using a sauna, resting while sick, sitting at a desk or in Church, etc.
- If sick, use passive rest and let the body recover



Low Impact

- Swimming is a low impact exercise that uses every muscle in the body; excellent alternative for rest days and for those with mobility problems
- Gardening counts as low impact; be sure to keep hydrated and work for at least one hour for full benefits
- Walking, Tai Chi, Croquet, and motion-based video games will not raise heart rates high



Sauna

- Saunas help relax muscles, rid the body of toxins, and cleanses skin pores
- There are two kinds of saunas: steam and dry; steam saunas are the traditional model with a central stove carrying rocks on top – heat radiates in the room and pouring water on the rocks creates steam; dry saunas use radiating heat and cycles the moisture in the air – considered safer as heat is better controlled
- Best used after any exercise sessions are finished; followed by a shower
- Not for weight loss; the sauna causes body water loss, which many think means fat loss; there is some fat that comes out with your sweat, but not a lot; drink a full glass of water before entering or you will have dehydration problems
- Public saunas have rules of etiquette; wear a towel that covers you, do not disturb the other patrons, ask all within if they're good with pouring more water on the rocks, etc.
- There are full sized flat pack kits to build a sauna in the home and small, inexpensive, foldable one person tents



Home Defense

- We will not discuss weaponry/offense tactics here; this is just for defense
- In days to come, the Saints will need to cope and survive with natural disasters, local riots and gang fights, pandemics, also conventional and atomic warfare
- Sandbags will serve the purpose of defense for many of these scenarios: bullet and blast resistant, in thick layers will hold back flood waters and radiation, and are cheap and easy to make
- Concrete works just as well and is a better insulator against fallout radiation
- Have a radio handy for all news and weather warnings; a Geiger counter (pictured above) for detecting radiation is good, but not essential right now; have potassium iodine tablets and a well stocked first aid kit ready
- Taping up or filming your windows will help keep small shards of glass from harming you in a blast or impacts from rioters

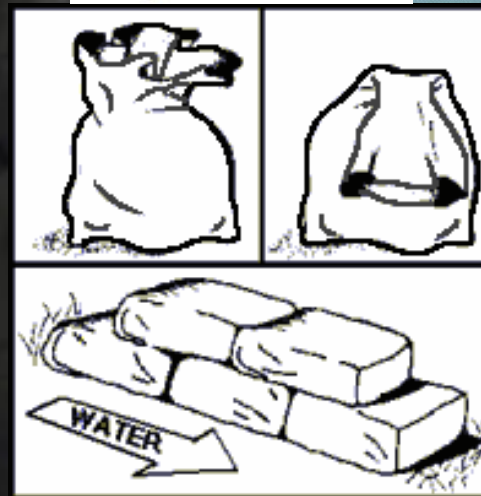
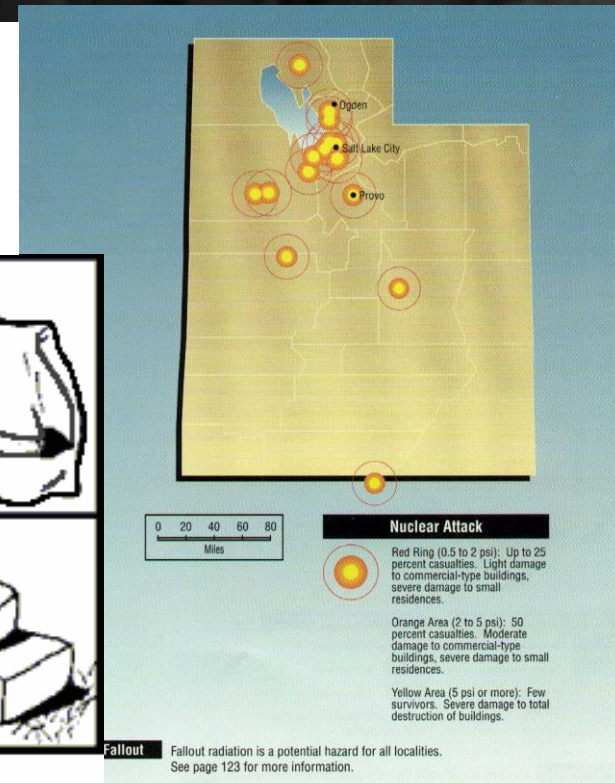
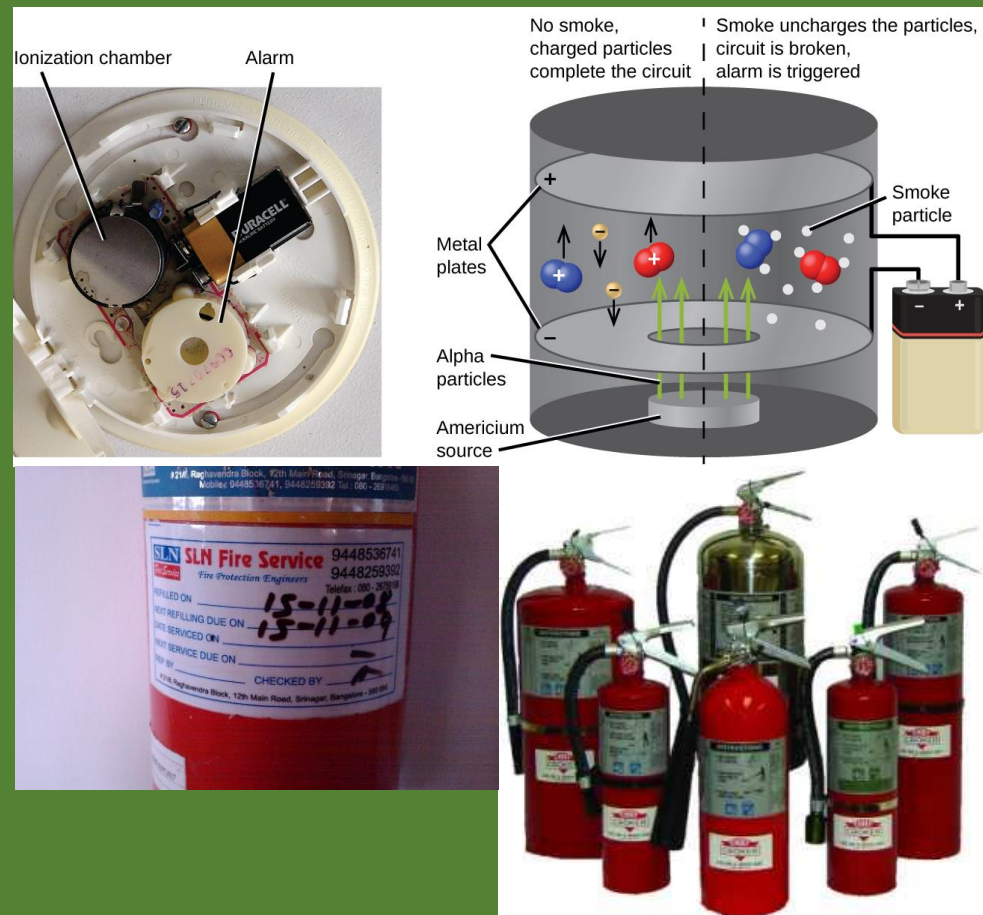


Fig.4 SANDBAG PLACEMENT



CO2 & Smoke Detectors / Fire Extinguishers

- Standard additions to the home that sometimes go unchecked
- Replace batteries every six months (easiest timed for the start of General Conference); test each month
- Fire Extinguishers do expire and will not be effective after the expiration date; check when changing batteries in detectors
- Do not throw away expired metal extinguishers: some are refillable for a lower price than a new one while others are disposable; if not refillable, empty contents safely and break nozzle to release the pressure; cut the top off and keep the flat base intact; use as a crucible for noble metal foundry work



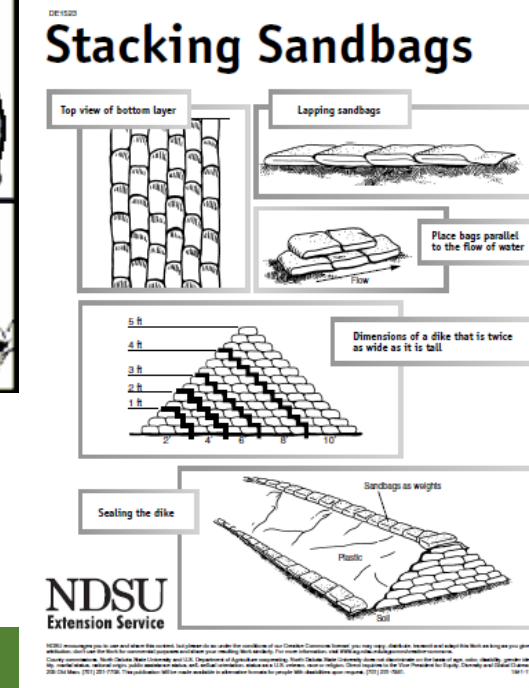
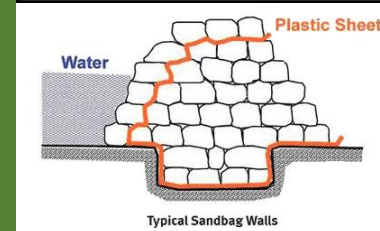
Home Security Systems

- Home alarms are expensive, but new DIY kits are now available; these kits give an option between localized alarms only or localized alarms plus calls to 911 for a fee
- Avoid systems where the alarm requires a landline and/or is tied to the house power supply – too easy to compromise; look for systems that utilize WIFI/cell calling, backup battery power, and function independently on some level without a service contract or subscription
- A family dog can also be trained to serve the same function; some breeds are naturals at barking at anything unusual
- For seniors and disabled family members services like LifeAlert and First Alert provide similar assistance; when a button on a bracelet or necklace is pressed a very loud “CALLING FOR HELP” or an alarm goes off followed by a live operator answering from a secure device; if the operator doesn’t get a response or hears anything that sounds like distress they notify the family and call authorities to respond at once



Sandbags

- As the number of domestic disturbances and riots increase, the need to increase your family's protection rises and a sandbag pillbox can help; build one of these if civil unrest in our area becomes an issue as it does ruin interior design aesthetics
- To make sandbags: sew linen sheets into bags 14 wide by 26 inches long up to 17 wide by 32 inches long, with an opening in the narrow end, and fill half way with sand or garden soil so they will lay flat rather than round; \$30 material gets you a 10' tall X 10' long wall
- Pick an interior wall with a view of most outside doors and windows, and set up sandbags in an overlapping, circular pattern beside it; make it however high you need to comfortably take shelter behind with some spots low enough to enter and exit; can use bullet-resistant paneling to reinforce
- Inside the pillbox store food, water, first-aid supplies, 2-3 fire extinguishers, weapons, a radio, and a spare phone
- Sandbagging for a flood works on the same principle, except the sandbags are stacked with a plastic sheet around them, and the bags placed in a pyramid shape, instead of a vertical wall, to hold the weight of the water

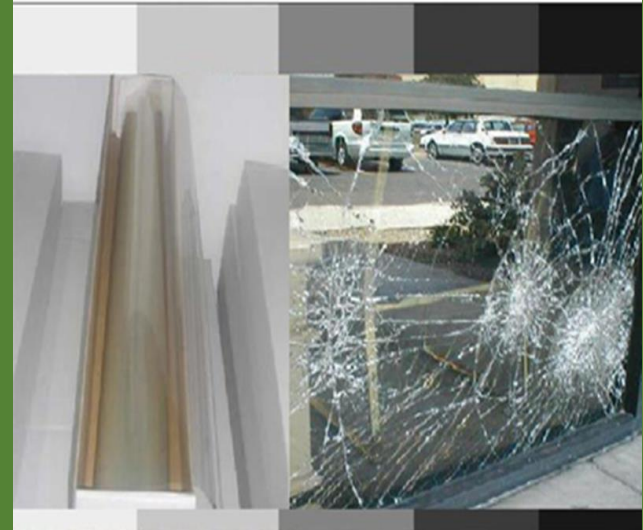


Windows

- The weakest part of the home and a source of sharp, flying shrapnel – windows and glass doors during conflict times must be secured
- During WWII everyone would tape their windows so when a conventional bomb went off the window would break in a large sheet and fall to ground rather than shatter and tear everyone up
- Cities would also blackout windows to prevent light from guiding bombers to the area: this was more psychological for the citizens of a town than an effective deterrent as the enemy already knew where the cities were; the strategy being bonfires lit in the countryside would hopefully draw the bombers to empty fields instead of to the blackened city; didn't work often enough to be effective
- During the Cold War, the recommendation was to tape up and whitewash windows so when the atomic bomb went off the inhabitants wouldn't get flash blinded and then shredded
- Today we have films available that do a variety of functions; from UV filtering to security strengthening, all provide better shatter-resistance than taping the windows in WWII; however, these films are expensive, so if cost is a factor then taping windows and sandbagging still works

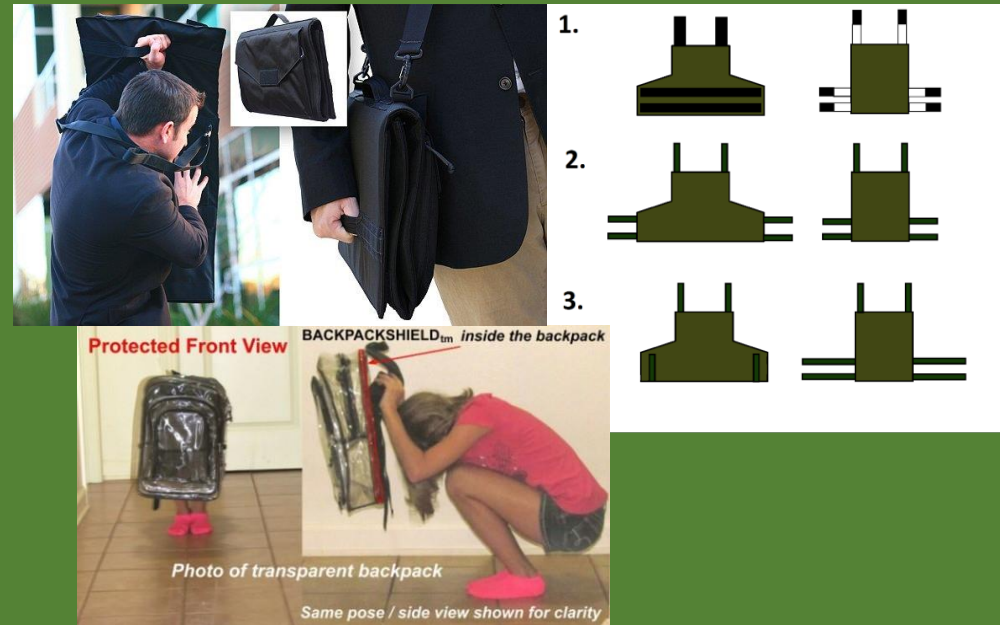


WINDOW SECURITY FILM



Bullet-Resistant Paneling

- The right to keep and bear arms is an inalienable right and will remain so; there are people who will inevitably abuse this right of self-defense
- Kevlar and dense ceramic plates are moderately expensive and heavy, but there is an alternative – fiberglass panels
- To make: get woven fiberglass cloth (not insulation), a wooden mold, a bandsaw, and epoxy; layer fiberglass 26-48 times (depending on how much protection is desired), each time applying the epoxy - work fast as it sets up quick; when finished, place the epoxy coated cloth in a mold and secure tightly - let cure for one week; use a bandsaw to trim the borders; test all prototypes at a firing range **before** trusting your life to it
- Effective against most small caliber rounds and shotguns – be sure to test before wearing; have a form of padding on between you and the plate; works as a backpack/briefcase insert



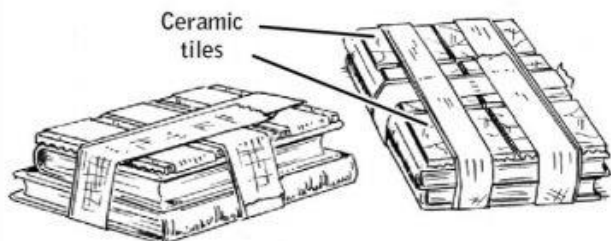
No. 008: Use Improvised Body Armor

CONOP: Build expedient body armor using everyday items.

COA 1: Acquire hardback books, duct tape, and ceramic tiles.



COA 2: Tape two or more books together to create one plate. Construct two plates. Tape on a layer of ceramic tiles.



COA 3: Add shoulder straps made of tape to create a body-armor system.



COA 4: Conduct jump test and add tape as needed to increase integrity.

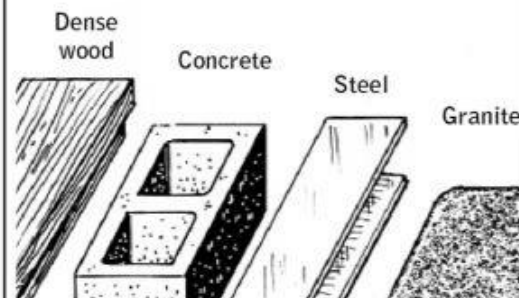


BLUF: As a method of last resort, operatives can use hardcover books to deflect projectiles.

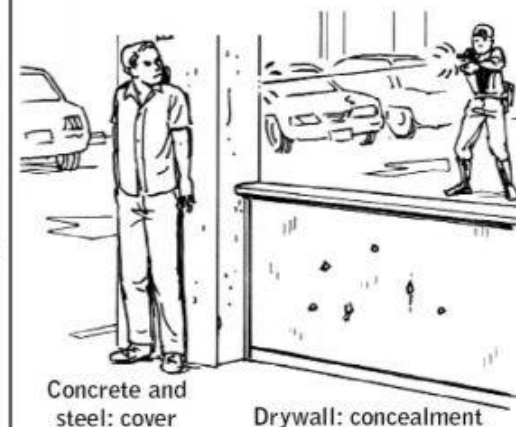
No. 009: Identify Emergency Ballistic Shields

CONOP: Know where to take cover when caught in crossfire.

COA 1: Bullet-slowing and -stopping materials



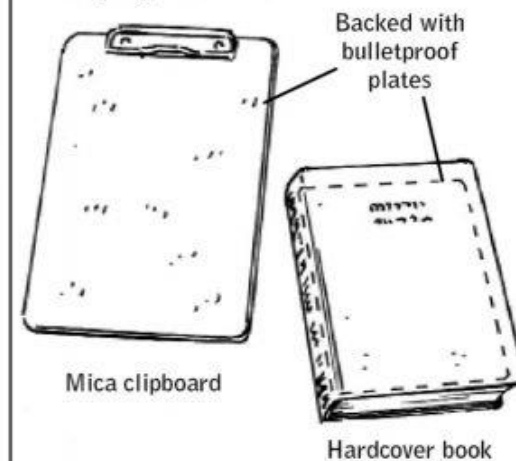
COA 2: Know the difference between cover and concealment. Cover stops bullets, concealment doesn't.



COA 3: Identify and use makeshift structures while at home or in public.



COA 4: Acquire bulletproof materials and disguise as everyday items.



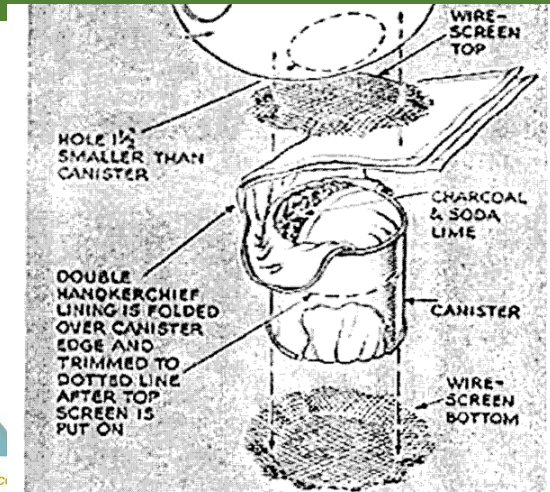
BLUF: Always choose cover over concealment; rapidly move from cover to cover.

Gas Masks

- Gas masks use a combination of woven and chemical filters to clean the air of pollutants and NBC weapons
- A simple mask is made with a 2-liter soda bottle but uses a low-grade fumes mask
- A proper gas mask filter is made with a #2 food can, pulverized charcoal, powdered soda ash, and two squares of linen: place the charcoal and soda ash into the linen separately and tie closed; place into the can with charcoal bag on bottom – soda ash on top; duct tape onto soda bottle lid; use a hair dryer to blow out excess dust; also used attached to a fallout shelter (faced downward); add a HEPA filter between you and the soda ash bag if needed
- To make soda ash: measure two cups of baking soda and weigh (make a record of the weight), place in a skillet and heat on low until very warm – gently stir occasionally; reweigh after each 10 minutes on the heat until the power loses half it's weight or close to it; the heat converts the sodium bicarbonate to sodium carbonate (soda ash); store in an airtight container



KeepShooting.c

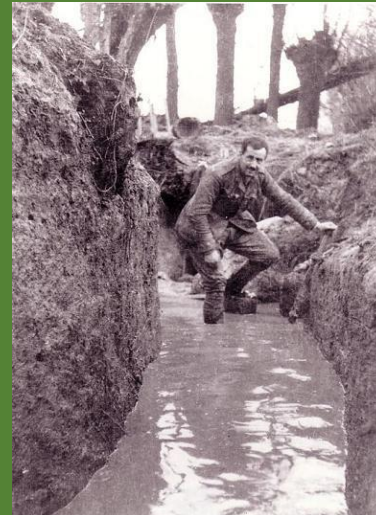


KeepShooting.c



Trenches

- Historically, trenches were built outside fortifications to slow down advancing forces; in WWI, trenches offered some protection to bunkering soldiers; today, trenches are for flood control and fire breaks
- Before planning a trench system, call Blue Stakes at 811 for a free survey, and look up your home's flood potential at <https://slco.org/flood-control/fema-floodplain-maps/>
- Digging open trenches for defense is not practical in our area and offers little extra protection in our day and age



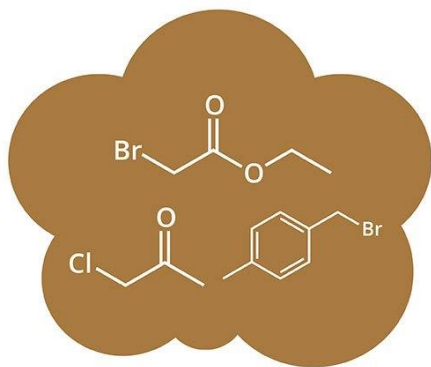
Chemical and Biological Attacks

- Terrorists and foreign military personnel use a variety of weapons to scare and harm a population; two means of accomplishing this is through using a chemical or biological weapon
- Chemical weapons are aerosols and liquids that cause bodily harm on contact; biological weapons are living, highly contagious pathogens; both carried in small containers and released into the target population
- If exposed to chemical attack: quickly leave the affected area into open air; find anywhere to with access to soap and water; remove all outer clothing and wash yourself thoroughly, next contact 911 about the attack and your current location
- Biological attacks are much more insidious as you won't know if you're exposed until symptoms develop, and even then health authorities may not know what to look for for some time
- An NBC gas mask (Nuclear/Biological/Chemical) would protect you in this situation so long as the mask is applied **before** exposure



CHEMICAL WARFARE WORLD WAR I

WORLD WAR I IS SEEN AS THE DAWN OF MODERN CHEMICAL WARFARE. SOME 50 DIFFERENT CHEMICAL AGENTS WERE DEPLOYED ON THE BATTLEFIELDS, AND 3,000 CHEMICALS WERE INVESTIGATED AS POTENTIAL WEAPONS. THEIR USE CAUSED APPROXIMATELY 1.3 MILLION NONFATAL CASUALTIES, AND 90,000–100,000 FATALITIES. HERE, WE SUMMARIZE THE MOST PREVALENT OF THE CHEMICALS USED.



TEAR GASES

(ethyl bromoacetate, chloroacetone & xylyl bromide)

SMELL & APPEARANCE

Both ethyl bromoacetate and chloroacetone are colorless to light yellow liquids with fruity, pungent odors. Xylyl bromide is a colorless liquid with a pleasant, aromatic odor.

EFFECTS

Tear gases are what are known as lachrymatory agents: They irritate mucous membranes in the eyes, mouth, throat, and lungs, leading to crying, coughing, breathing difficulties, and temporary blindness.

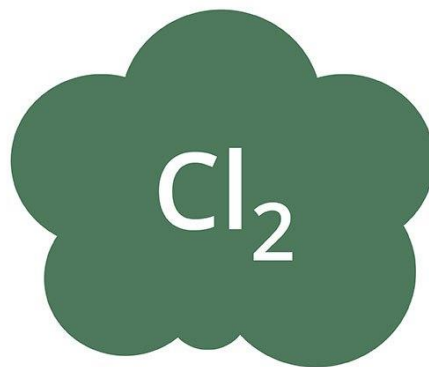
FIRST USED

1914 In August, the French used tear gas grenades against the German Army, to little effect.

ESTIMATED CASUALTIES

0 These gases were used to incapacitate enemies rather than to kill; the symptoms commonly resolved within 30 minutes of leaving the affected area.

fatalities in World War I



CHLORINE

SMELL & APPEARANCE

Chlorine is a yellow-green gas with a strong, bleachlike odor. Soldiers described its smell as “a distinct mix of pepper and pineapple.”

EFFECTS

Chlorine reacts with water in the lungs, forming hydrochloric acid. Coughing, vomiting, and irritation to the eyes occur at low concentrations. At concentrations of 1,000 parts per million, it leads to rapid death.

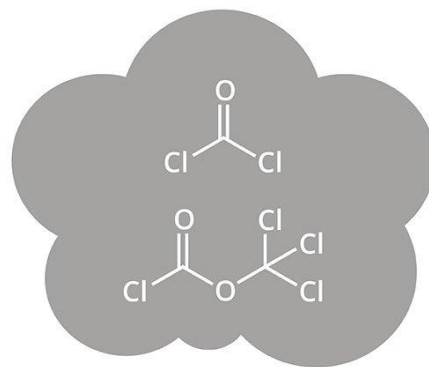
FIRST USED

1915 German forces used chlorine near Ypres, Belgium, in April. British forces retaliated in September, at Loos, France.

ESTIMATED CASUALTIES

>1,100 Chlorine was devastating because troops were initially unequipped to deal with it. Later, gas masks limited its effectiveness.

estimated fatalities in first use of chlorine at Ypres



PHOSGENE & DIPHOSGENE

(carbonyl dichloride & trichloromethane chloroformate)

SMELL & APPEARANCE

Phosgene is a colorless gas with a musty odor comparable to that of newly-mown hay or grass. Its density is four times that of air. Diphosgene is a colorless, oily liquid.

EFFECTS

They react with proteins in lung alveoli, causing suffocation. They cause coughing, difficulty breathing, and irritation to the throat and eyes. Have delayed effects, not evident for 48 hours, leading to death.

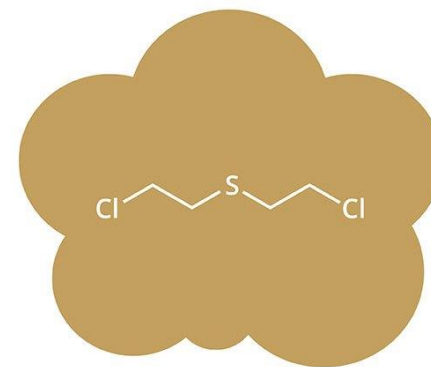
FIRST USED

1915 In December 1915, German forces used phosgene against the British at Ypres.

ESTIMATED CASUALTIES

85% It's estimated that this pair caused a majority of gas-related fatalities. Phosgene was primarily deployed from gas canisters. Both chemicals were used to fill artillery shells.

of all gas-related fatalities in WWI



MUSTARD GAS

(bis(2-chloroethyl) sulfide)

SMELL & APPEARANCE

When pure, mustard gas is a colorless and odorless liquid. In its impure form, it's used as a chemical agent. Then, it's yellow-brown in color and has a variable odor resembling garlic, horseradish, or rubber.

EFFECTS

Irritant and blistering agent that damages the eyes, skin, and respiratory tract. It causes chemical burns on contact with skin. Effects are delayed by hours, and repeat exposure increases sensitivity and blistering.

FIRST USED

1917 On July 12, 1917, German forces used mustard gas against the British at Ypres.

ESTIMATED CASUALTIES

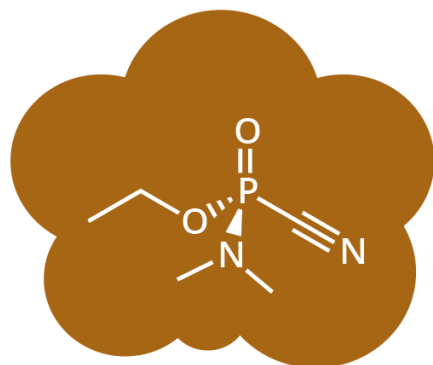
2–3% The mortality rate of mustard gas casualties was low, but the gas's effects were debilitating, and patients required elaborate care.

of mustard gas casualties died in WWI

CHEMICAL WARFARE NERVE AGENTS

PART ONE: THE G SERIES

THE G SERIES NERVE AGENTS ARE SO NAMED BECAUSE THEY WERE ALL FIRST SYNTHESISED IN GERMANY. THEY ARE ALL EXTREMELY TOXIC VOLATILE LIQUIDS, CLASSIFIED AS WEAPONS OF MASS DESTRUCTION BY THE U.N., AND THEIR PRODUCTION & STOCKPILING IS OUTLAWED.



TABUN (GA)

(ethyl dimethylphosphoramidocyanide)

SMELL & APPEARANCE

Clear, colourless liquid, though impure tabun can have a brown appearance. Pure tabun is odourless, but it often has a faint 'fruity' odour due to impurities.

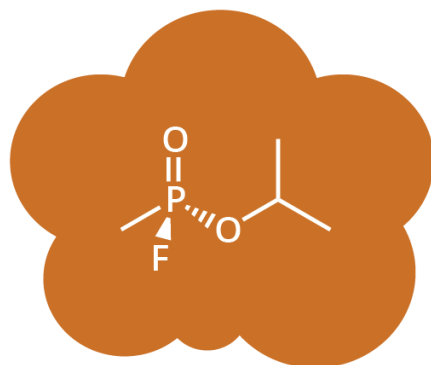
SYNTHESISED

1936 Discovered accidentally by Gebhardt Schrader, a German chemist who was investigating organophosphates as pesticides.

LETHALITY

median lethal concentration
400
milligram-minutes per
cubic metre

median lethal dose
1000
milligrams per kilogram
of body weight



SARIN (GB)

(isopropyl methylphosphonofluoridate)

SMELL & APPEARANCE

A clear, colourless liquid, tasteless and odourless in its pure form. It's a volatile liquid; like other nerve gases the vapour generated is heavier than air.

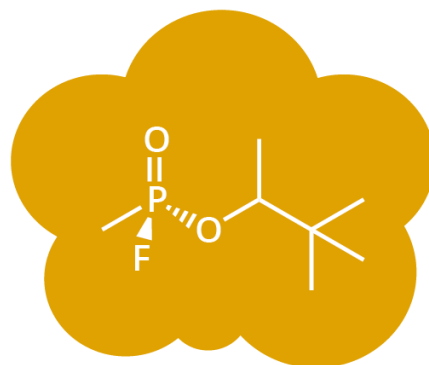
SYNTHESISED

1938 Named after the team of scientists behind its initial discovery: Schrader, Ambros, Ritter & Van der Linde

LETHALITY

median lethal concentration
100
milligram-minutes per
cubic metre

median lethal dose
1700
milligrams per kilogram
of body weight



SOMAN (GD)

(3,3-dimethylbutan-2-yl methylphosphonofluoridate)

SMELL & APPEARANCE

Soman is a clear, colourless, tasteless liquid. Its odour is faint when pure, but when impure it has a yellow-brown colour and has a strong, camphorous odour.

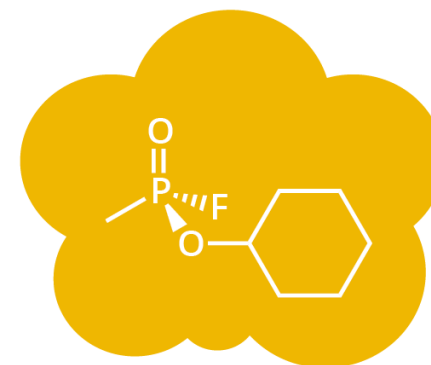
SYNTHESISED

1944 Discovered during research into the pharmacology of tabun & sarin funded by the German army.

LETHALITY

median lethal concentration
70
milligram-minutes per
cubic metre

median lethal dose
50
milligrams per kilogram
of body weight



CYCLOSARIN (GF)

(cyclohexyl methylphosphonofluoridate)

SMELL & APPEARANCE

Clear, colourless liquid with a sweet, musty smell, sometimes likened to peaches. It evaporates around 70 times slower than sarin, and is also flammable.

SYNTHESISED

1949 Also a result of German research, Iraq is the only country known to have manufactured significant quantities.

LETHALITY

median lethal concentration
50
milligram-minutes per
cubic metre

median lethal dose
30
milligrams per kilogram
of body weight

EFFECTS OF NERVE AGENTS



Inhibit breakdown of
acetylcholine



Cause contraction of
the pupils



Excessive mucus, tears,
saliva & sweat



Nausea, gastrointestinal
pain & vomiting



Bronchoconstriction &
chest tightness



Spasms, convulsions
& loss of bowel control



Coma & eventual
death



Pandemic PLANNING

This graphic illustrates a range of controls that could help prevent the spread of infection during a pandemic. Workplaces may want to adopt these controls for different areas as appropriate.

DEVELOP A BUSINESS CONTINUITY PLAN

A business continuity plan (BCP) can help minimise the impact of a pandemic on your business. Good communication between employers, employees, unions, suppliers and clients is vital to creating a good plan.



WORK REMOTELY

Many staff can work just as productively from home or other places remote from the workplace – reducing the risk of infection by people working closely together.



SHOP ON THE INTERNET

Workplaces can greatly reduce their chances of coming into contact with an infection by removing the need for customers to enter their premises. Online trading supported by a goods delivery service may be appropriate.



USE SCREENS

Screens can enable businesses to provide face to face customer service where necessary – without the risk of exposure to an infection. A good example of this arrangement is night windows in service stations.



MANAGE YOUR STAFF

An influenza manager can manage rosters, ensure that staff with symptoms are sent home and monitored, facilitate remote working and manage sick leave issues – reducing the risk of infection spreading in your workplace.



Customers

MANUFACTURING

NURSING / CARE

TALK TO EACH OTHER

HOSPITALITY

Supermarkets

RETAIL

INCREASE SOCIAL DISTANCING

When people are further apart they have less chance of transferring an infection. The wearing of masks and the practising of good personal hygiene will also help.



VENTILATE

Fresh air ventilation (open windows) or mechanical ventilation (well maintained air-conditioning systems) reduce the likelihood of someone becoming infected by a person somewhere else in the vicinity.



TRAIN YOUR STAFF

Effective training in personal hygiene, social distancing and correct fitting, use and disposal of Personal Protective Equipment will determine how confident your staff and customers are about your control measures.



PRACTISE GOOD HYGIENE

People may be capable of passing on an infection by coughs, sneezes or touch, even those who don't have obvious symptoms. Good hygiene practice such as washing and drying hands, putting your hand over your mouth when you cough and covering food can reduce the chances of this happening.



Goggles

Masks

Gloves

PROTECT YOUR STAFF

Personal Protective Equipment (PPE), if properly used, can be an effective barrier against infection. Choosing the right PPE and training in its use are essential.



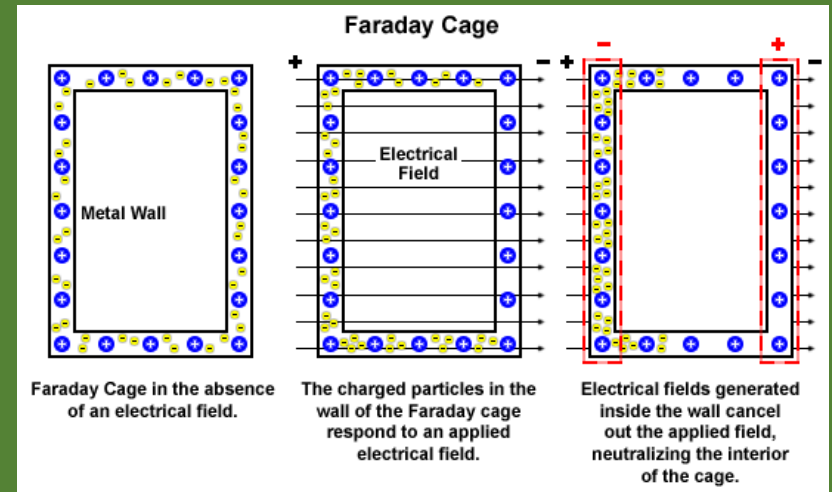
Nuclear Blast and Fallout Shelters

- A nuclear blast shelter protects against both blast and fallout, while a fallout shelter cannot withstand blast; our Stake and Ward area is not at risk for a direct nuclear strike - however the State Capitol, SL International Airport, Dugway, Hill AFB, Camp Williams, Fort Douglas, and Northrop Grumman are - so we will focus on fallout shelters
- 1950's and 60's era fallout shelters have become a staple of pop culture; in reality most were only reinforced basements or a central room, most folks planned to build one only during a nuclear attack out of stuff found around the house
- The ideal fallout shelter will protect your family behind 3-4 feet of soil, 2-3 feet of concrete, or a combination of the two; radiation penetrates the space between atom nuclei – the more nuclei between you and the radiation the better
- Have potassium iodine tablets for every family member - take only when civil authorities direct; another consideration is having a supply of sedatives and tranquilizers to help with being cooped up for weeks with no daylight



Faraday Cages

- A high altitude nuclear blast creates a wave of static electricity known as an Electromagnetic Pulse (EMP); EMP's magnetize metals and will destroy circuit boards by scrambling the metal within, disrupt power grids by destroying transformers, and can setback the country to the early 1970's; high altitude nuclear tests destroyed orbital satellites, even satellites launched months afterwards
- Faraday cages are grounded metal cages made of ferrous metals or insulated containers; an easy faraday cage is a blanket lined metal trash can; if you build a full cage, be sure to attach a wire and ground it – the static electricity will get absorbed by the cage and directed through the wire, where it will harmlessly get dispersed in the soil; some businesses have gone so far as constructing the entire building as a cage



EXPEDIENT FALLOUT SHELTER

ABOVE-GROUND DOOR-COVERED SHELTER

GENERAL INFORMATION

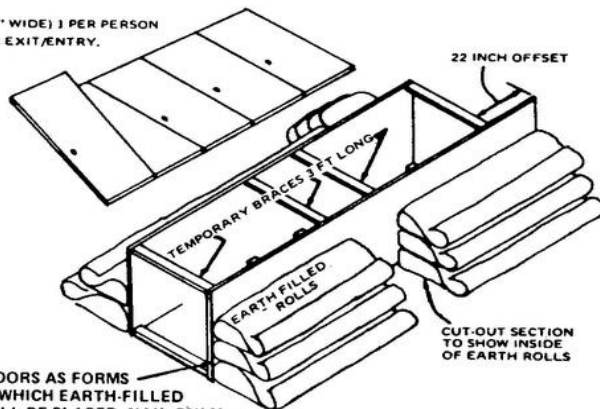
THE ABOVE-GROUND DOOR-COVERED SHELTER IS DESIGNED FOR AREAS WHERE BELOW-GROUND SHELTERS ARE IMPRACTICAL BECAUSE THE GROUNDWATER TABLE OR BEDROCK IS CLOSE TO THE GROUND SURFACE. THIS SHELTER CAN BE BUILT BY FOUR PERSONS WORKING A TOTAL OF 10 HOURS EACH.

READ AND STUDY ALL INSTRUCTIONS BEFORE STARTING TO BUILD. IF DOOR WIDTHS MEASURE LESS THAN 32 INCHES, USE A COMBINATION OF DOORS TO PROVIDE A MINIMUM OF 32 INCHES OF DOOR-WIDTH PER PERSON.

STEP 1

SELECT A SHELTER LOCATION WHERE THERE IS LITTLE OR NO CHANCE OF RAINWATER PONDING ON THE GROUND SURFACE. STAKE OUT SHELTER, REMOVE DOOR KNOBS. ALLOW 1 DOOR FOR EACH PERSON PLUS 1 DOOR FOR ENTRY/EXIT AT END. LIMIT IS 8 PERSONS PER SHELTER.

DOORS (32" WIDE) 1 PER PERSON PLUS 1 FOR ENTRY/EXIT.



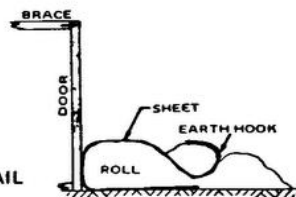
STEP 2

SET UP DOORS AS FORMS AROUND WHICH EARTH-FILLED ROLLS WILL BE PLACED. NAIL ONLY TOP BRACES. NAILS MUST BE REMOVED LATER. BRACE ALL CORNERS, CENTER, TOP AND BOTTOM OF EACH DOOR.

STEP 3

BEGIN TO PLACE EARTH-FILLED ROLLS AGAINST DOOR FORMS. TO FORM EARTH ROLLS, SEE EARTH-FILLED ROLL DETAIL BOTTOM OF PAGE.

EARTH-FILLED ROLL DETAIL



1. PLACE 2 FT OF SHEET ON GROUND AND TEMPORARILY DRAPE REMAINDER OF SHEET ON DOOR
2. PLACE EARTH ON SHEET - SHAPE AS SHOWN.
3. FOLD SHEET OVER SHAPED EARTH.
4. PLACE EARTH ONTO SHEET AT NARROW TRENCH.
5. FOLD SHEET TO FORM EARTH HOOK. HOOK WILL ANCHOR SHEET.
6. REPEAT TO FORM NEXT EARTH-FILLED ROLL.

STEP 4

DIG 14" DEEP, 36" WIDE TRENCH INSIDE SHELTER. EARTH CAN BE USED TO FORM SIDE EARTH FILLED ROLLS. TRENCH CAN BE MADE UP TO 3 FEET DEEP IF CONDITIONS PERMIT.

STEP 5

MOUND EARTH AGAINST THE EARTH-FILLED ROLLS AS SHOWN. CONTINUE PLACING EARTH AND SHEETS TO FORM EARTH-FILLED ROLLS.

STEP 6

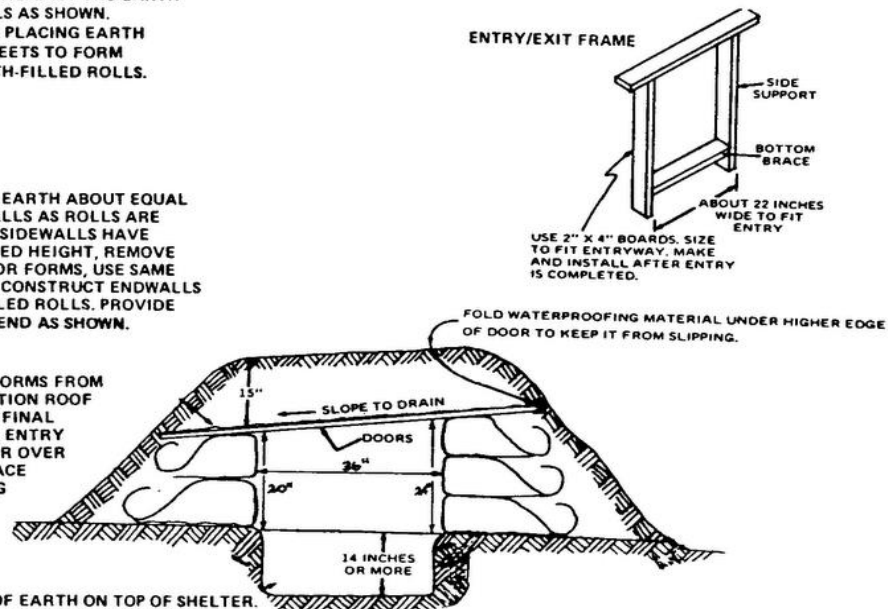
KEEP HEIGHT OF EARTH ABOUT EQUAL ON BOTH SIDEWALLS AS ROLLS ARE FORMED. AFTER SIDEWALLS HAVE REACHED PLANNED HEIGHT, REMOVE BRACES AND DOOR FORMS, USE SAME DOOR FORMS TO CONSTRUCT ENDWALLS WITH EARTH FILLED ROLLS. PROVIDE EXIT/ENTRY AT END AS SHOWN.

STEP 7

REMOVE DOOR FORMS FROM ENDWALLS. POSITION ROOF DOORS IN THEIR FINAL POSITION. PLACE ENTRY FRAME FOR DOOR OVER ENTRY/EXIT. PLACE WATERPROOFING MATERIAL ON DOORS.

STEP 8

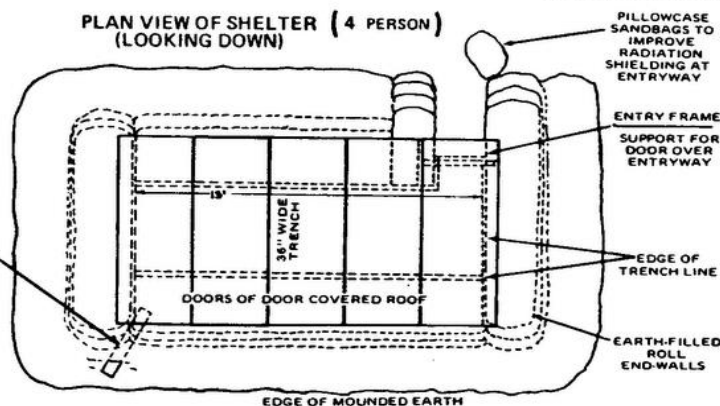
PLACE 15 INCHES OF EARTH ON TOP OF SHELTER. IN HOT WEATHER CONSTRUCT A SHELTER VENTILATION AIR PUMP. SEE AIR PUMP DETAILS ON LAST PAGE.



NOTE: IF TRENCHING IS IMPRACTICAL HEIGHTEN WALLS BY USING ADDITIONAL EARTH ROLLS.

PLAN VIEW OF SHELTER (4 PERSON)

(LOOKING DOWN)



TOOLS AND MATERIALS

1. Doors as indicated.
2. Pick or Mattock and Shovel.
3. Two Buckets or Large Cans to Carry Earth.
4. Tape Measure, Yardstick or Ruler.
5. Saw, Axe or Hatchet.
6. Hammer and at least 20 Nails - 2 1/2" long.
7. At least 4 Double Bed Sheets for Each Person to be Sheltered.
8. Pillowcases and Rainproofing Materials such as Plastic or Polyethylene.
9. Work Gloves for Each Worker.
10. Lumber for use as Temporary Braces and for Entry/Exit Frame.

EXPEDIENT FALLOUT SHELTER

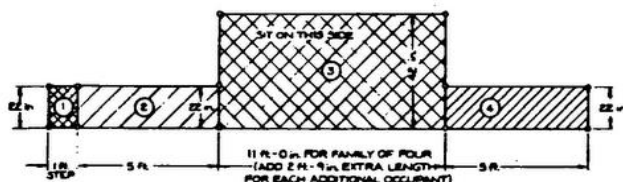
LOG-COVERED TRENCH SHELTER

GENERAL INFORMATION

THIS SHELTER IS DESIGNED FOR AREAS WHERE THE DEPTH BELOW THE GROUND SURFACE TO HARD ROCK OR GROUNDWATER IS BELOW THE BOTTOM OF THE TRENCH. ALSO, THE EARTH MUST BE SUFFICIENTLY FIRM AND STABLE SO THAT THE TRENCH SIDEWALLS WILL NOT CAVE IN. IN ADDITION, ADEQUATE SMALL TREES THAT CAN BE CUT FOR LOGS MUST BE AVAILABLE IN THE IMMEDIATE AREA. THE SHELTER (4-PERSON CAPACITY) CAN BE BUILT BY 4 PEOPLE WORKING A TOTAL OF 12 HOURS EACH. AFTER INITIAL COMPLETION, THE SHELTER CAN BE ENLARGED TO A WIDTH OF 5 FT.-6 IN. AND DEEPEMED TO 6 FT. HOWEVER, 9-FT LOGS MUST BE USED IN PLACE OF 7-FT LOGS AND THE BURIED ROOF MUST BE LARGE ENOUGH TO COVER THE WIDENED SHELTER DURING THE INITIAL CONSTRUCTION.

STEP 1

CLEAR AREA OF BRUSH AND TALL GRASS. LAYOUT SHELTER AS SHOWN BELOW.



LEGEND:

○ = WOOD OR METAL STAKE

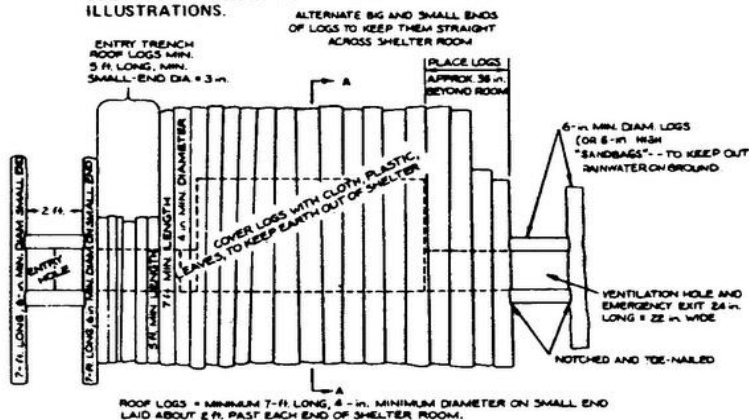


STEP 2

BEGIN EXCAVATING THE TRENCH. PLACE EXCAVATED EARTH AT LEAST 3 FEET BEYOND THE EDGE OF TRENCH SO THAT THE ROOF LOGS CAN LATER BE PLACED OVER THE TRENCH.

STEP 3

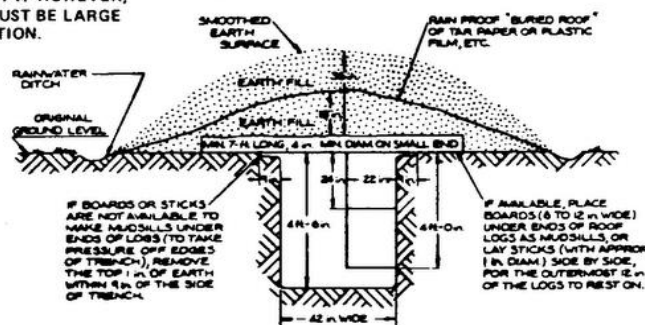
AS THE TRENCH EXCAVATION PROGRESSES, SOME WORKERS SHOULD BEGIN CUTTING LOGS TO THE LENGTH AND SIZE AS SHOWN ON THE ILLUSTRATIONS.



PLAN VIEW OF TOP OF SHELTER

STEP 4

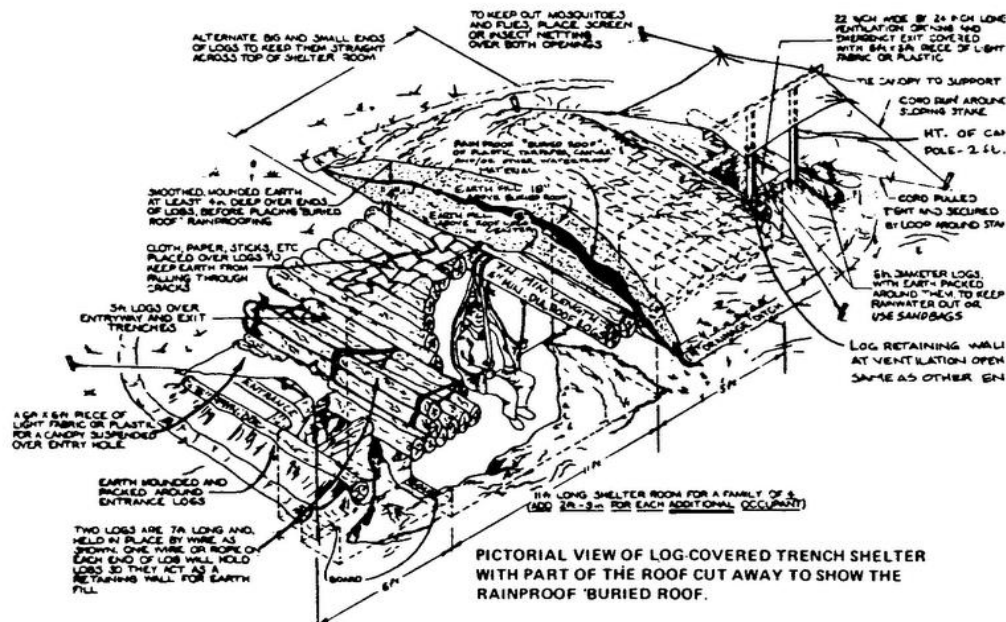
PLACE LOGS OVER TRENCH. POSITION TIES FOR BED, SHEET CHAIRS OR HAMMOCKS. PLACE NEWSPAPER OR OTHER MATERIAL AS INDICATED OVER LOGS. PLACE EARTH FILL AND BURIED ROOF.



SECTION A-A

STEP 5

CONSTRUCT CANOPIES OVER THE OPENINGS.



PICTORIAL VIEW OF LOG-COVERED TRENCH SHELTER WITH PART OF THE ROOF CUT AWAY TO SHOW THE RAINPROOF 'BURIED ROOF'.

TOOLS AND MATERIALS

1. SAW AND/OR AXE.
2. PICK OR MATTOCK.
3. LONG-HANDLED SHOVELS.
4. RAINPROOFING MATERIAL (PLASTIC OR POLYETHYLENE) 25 SQUARE YARDS. FOR EACH PERSON ABOVE 4, ADD 2 SQ. YDS.
5. 50 FEET OF STRONG STRING OR CORD AND A KNIFE.
6. TAPE MEASURE OR YARD STICK.
7. AT LEAST 8 PILLOW CASES AND/OR SANDBAGS.
8. WORK GLOVES.
9. BED SHEETS FOR USE AS "CHAIRS" OR "HAMMOCKS" - 1 PER PERSON PLUS AT LEAST 15 FEET OF STRONG ROPE OR CORD PER BED SHEET.
10. 15 POUNDS OF NEWSPAPERS TO PLACE OVER ROOF LOGS TO KEEP EARTH FROM FALLING THROUGH CRACKS BETWEEN LOGS.

APPROX. NO. OF POLES REQ'D.

45 - 7' LONG 4" DIA.

10 - 5' " 4" "

EXPEDIENT FALLOUT SHELTER

TILT-UP DOORS AND EARTH

GENERAL INFORMATION

READ AND STUDY ALL INSTRUCTIONS BEFORE STARTING TO BUILD. THE LOCATION SELECTED FOR THIS SHELTER SHOULD BE LEVEL OR GENTLY SLOPING DOWN AND AWAY FROM THE MASONRY WALL. A THREE-PERSON SHELTER CAN BE CONSTRUCTED BY THREE PEOPLE WORKING A TOTAL OF 6 HOURS EACH.

STEP 1

LAY OUT THE TRENCH AND EARTH NOTCH WIDTHS, AS DIMENSIONED ON THE SECTION BELOW, ADJACENT TO A MASONRY WALL. DETERMINE THE LENGTH OF TRENCH AND NOTCH BY ALLOWING ONE DOOR WIDTH OF LENGTH PER PERSON TO BE SHELTERED.

STEP 2

EXCAVATE TRENCH AND EARTH NOTCH. PLACE EXCAVATED EARTH OUTSIDE SHELTER LIMITS FOR LATER USE.

STEP 3

REMOVE DOOR KNOBS FROM ALL DOORS. PLACE DOUBLE LAYER OF DOORS IN NOTCH AND AGAINST WALL AS SHOWN IN SKETCH. NAIL 1" X 8" BOARD TO DOOR EDGES AT ENTRANCE TO SERVE AS EARTH STOP. AFTER ATTACHING PLASTIC ENTRANCE COVER AS SHOWN, OR BUILD RETAINING WALL OF SANDBAGS IN LIEU OF BOARD. PLACE ONE DOOR ON EDGE LENGTHWISE AS THE END CLOSURE.

STEP 4

PLACE ONE END OF THE ROLLED UP WATERPROOFING MATERIAL UNDER THE TOP EDGE OF THE DOORS BEFORE EARTH FILL IS PLACED. BEGIN PLACEMENT OF EARTH FILL ON DOORS. COVER THE EARTH FILL WITH WATERPROOFING MATERIAL, SECURING IT WITH EARTH AT TOP AND BOTTOM TO PREVENT IT FROM BLOWING AWAY.

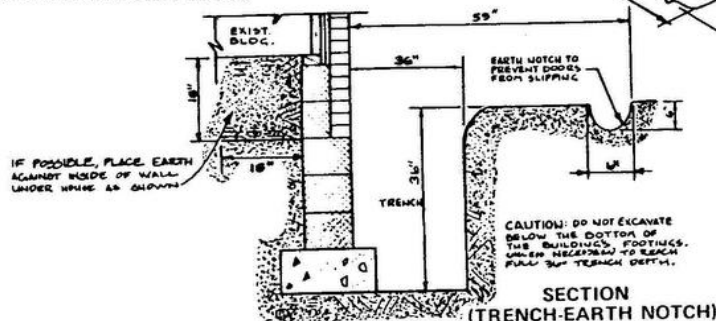
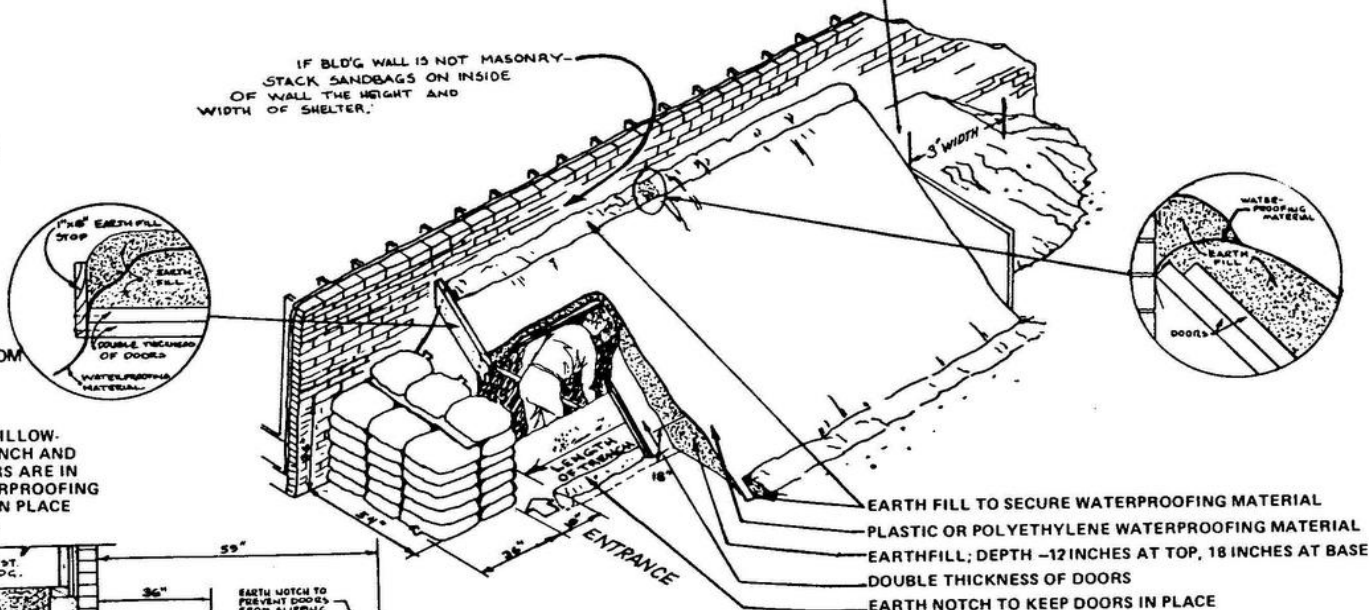
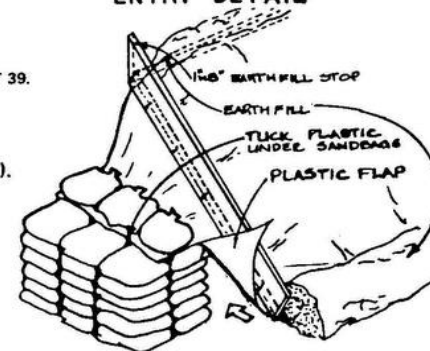
STEP 5

CONSTRUCT ENTRANCE - FILL "SANDBAG PILLOWCASES" WITH EARTH TAKEN FROM THE TRENCH AND STACK TO DIMENSIONS SHOWN AFTER DOORS ARE IN PLACE. PLASTIC OR POLYETHYLENE (WATERPROOFING MATERIAL) ENTRANCE COVER SHOULD BE IN PLACE BEFORE EARTH FILL IS PUT ON THE DOORS.

TOOLS AND MATERIALS

1. TOOLS: PICK, SHOVEL, HAMMER, SAW, SCREWDRIIVER, KNIFE, YARDSTICK.
2. SANDBAGS PILLOWCASES OR PLASTIC GARBAGE BAGS - AT LEAST 39.
3. LUMBER: 1" X 8" PIECE 7' LONG (OR 20 MORE SANDBAGS) FOR EARTH-FILL STOP AT ENTRANCE EDGE OF DOORS.
4. ROPE OR CORD TO TIE SANDBAGS.
5. DOORS: TWO LAYERS FOR LENGTH OF SHELTER PLUS ONE FOR END CLOSURE. (EXAMPLE: 7 DOORS FOR 3 PERSON SHELTER).
6. NAILS: 8 penny (2 1/2" LONG), ABOUT 10 TO NAIL EARTH STOP TO DOOR EDGES AT ENTRANCE.
7. PLASTIC OR POLYETHYLENE (WATERPROOFING MATERIAL) TO COVER DOUBLE LAYER OF DOORS PLUS ENTRANCE.
8. WORK GLOVES FOR EACH WORKER.

ENTRY DETAIL



EXPEDIENT FALLOUT SHELTER

CAR-OVER-TRENCH

GENERAL INFORMATION: READ AND STUDY ALL INSTRUCTIONS BEFORE BEGINNING. IF A BIG STATION WAGON IS USED, SHELTER CAN BE PROVIDED FOR UP TO 6 PERSONS, LESS IF CAR IS SMALLER. THIS SHELTER CAN NOT BE BUILT IN AREAS WHERE GROUNDWATER OR ROCK IS CLOSE TO THE GROUND SURFACE. SHELTER CAN BE CONSTRUCTED BY TWO PERSONS WORKING A TOTAL OF ABOUT 8 HOURS EACH.

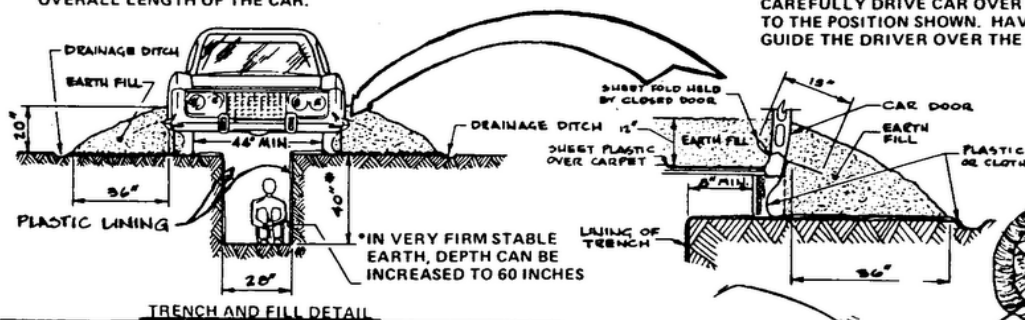
STEP 1

SELECT A LEVEL SITE. DIG A SMALL TEST HOLE ABOUT 10 INCHES DEEP. REMOVE ALL LOOSE EARTH FROM THE BOTTOM. PUSH THE POINT OF YOUR THUMB INTO THE UNDISTURBED EARTH IN THE BOTTOM OF HOLE. IF YOU CANNOT PUSH YOUR THUMB DEEPER THAN ONE INCH, THE EARTH SHOULD BE SUITABLE FOR THIS SHELTER. IF THUMB PENETRATES DEEPER THAN ONE INCH, MOVE TO ANOTHER SITE AND REPEAT TEST, BECAUSE EARTH AT THE TESTED SITE IS NOT SUITABLE.

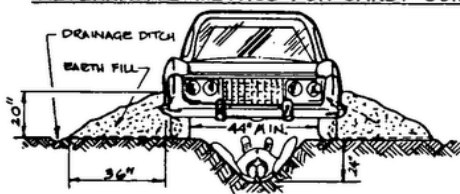


STEP 2

STAKE OUT DIMENSIONS SHOWN FOR TRENCH AND ENTRYWAY. NOTE THAT THE LENGTH OF TRENCH MUST BE 4 FEET LESS THAN THE OVERALL LENGTH OF THE CAR.



ALTERNATIVE METHOD FOR SANDY SOILS



A "SIT IN" SHELTER CANNOT BE DUG IN BEACH TYPE SAND, BECAUSE THE TRENCH WALLS WILL CAVE IN. HOWEVER, A "LIE IN" TRENCH CAN BE DUG AS SHOWN ABOVE AND STILL PROVIDE GOOD FALL-OUT PROTECTION. ALL OTHER STEPS REMAIN THE SAME.

TOOLS AND MATERIALS

1. CAR; CAUTION: CAR MUST HAVE AT LEAST 44 INCHES OF WIDTH BETWEEN INSIDE WALLS OF TIRES.
2. PICK AND LONG-HANDLED SHOVEL.
3. PLASTIC SHEETING AND/OR CLOTH APPROX. 10-12 BEDSHEETS OR EQUIV. AREA OF OTHER MATERIALS WILL BE REQUIRED.
4. SANDBAGS, SACKS OR PILLOWCASES, 9 REQUIRED.
5. 50 FEET OF STRONG STRING OR CORD AND A KNIFE.
6. YARDSTICK OR MEASURING TAPE
7. WORK GLOVES FOR EACH WORKER.
8. STAKES, 4 REQUIRED.



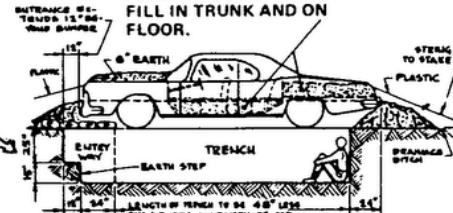
STEP 3

EXCAVATE TRENCH AND ENTRYWAY. AS TRENCH DEEPENS, REPEAT EARTH STABILITY TEST ON BOTTOM OF TRENCH. IF EARTH BECOMES "SOFTER" DO NOT DEEPEN TRENCH. PLACE EXCAVATED EARTH AWAY FROM TRENCH SO THAT CAR CAN BE DRIVEN OVER TRENCH.

STEP 4

LINE TRENCH WITH PLASTIC OR CLOTH. LINING SHOULD TOUCH FLOOR OF TRENCH AND EXTEND OUTWARD TO THE LIMIT OF EARTH FILL. AFTER TRENCH IS LINED, CAREFULLY DRIVE CAR OVER TRENCH TO THE POSITION SHOWN. HAVE SOMEONE GUIDE THE DRIVER OVER THE TRENCH.

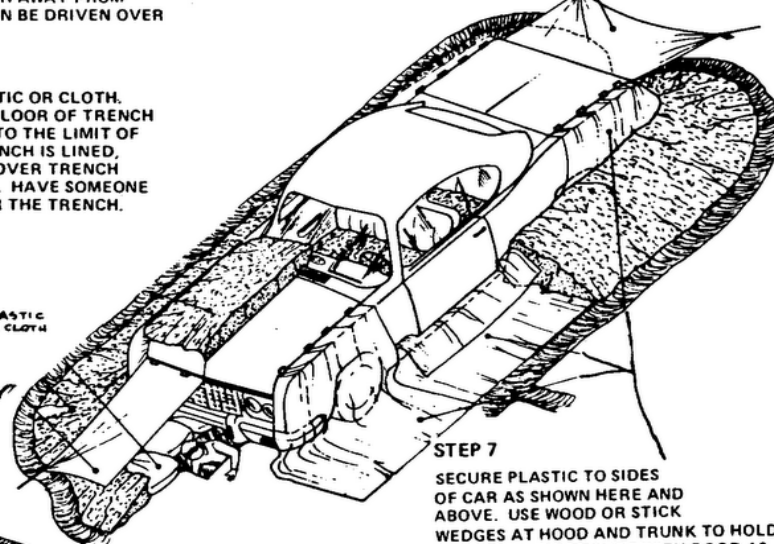
- ### STEP 5
- REMOVE ALL SEATS (IF POSSIBLE). COVER FLOOR AND TRUNK WITH PLASTIC; PLACE 1 FOOT OF EARTH FILL IN TRUNK AND ON FLOOR.



TRENCH AND ENTRYWAY DETAIL

STEP 6

PLACE PLASTIC COVER OVER ENTRANCE AND VENTILATION OPENINGS. SECURE UNDER HOOD AND TRUNK LID.



STEP 7

SECURE PLASTIC TO SIDES OF CAR AS SHOWN HERE AND ABOVE. USE WOOD OR STICK WEDGES AT HOOD AND TRUNK TO HOLD PLASTIC. ALSO SECURE WITH DOOR AS SHOWN ABOVE.

STEP 8

BANK EARTH AROUND CAR TO HEIGHT OF 20 INCHES

STEP 9

PLACE SANDBAGS AROUND ENTRANCE AND BANK EARTH AROUND THEM.

STEP 10

PLACE 8 INCHES OF EARTH ON CAR HOOD

STEP 11

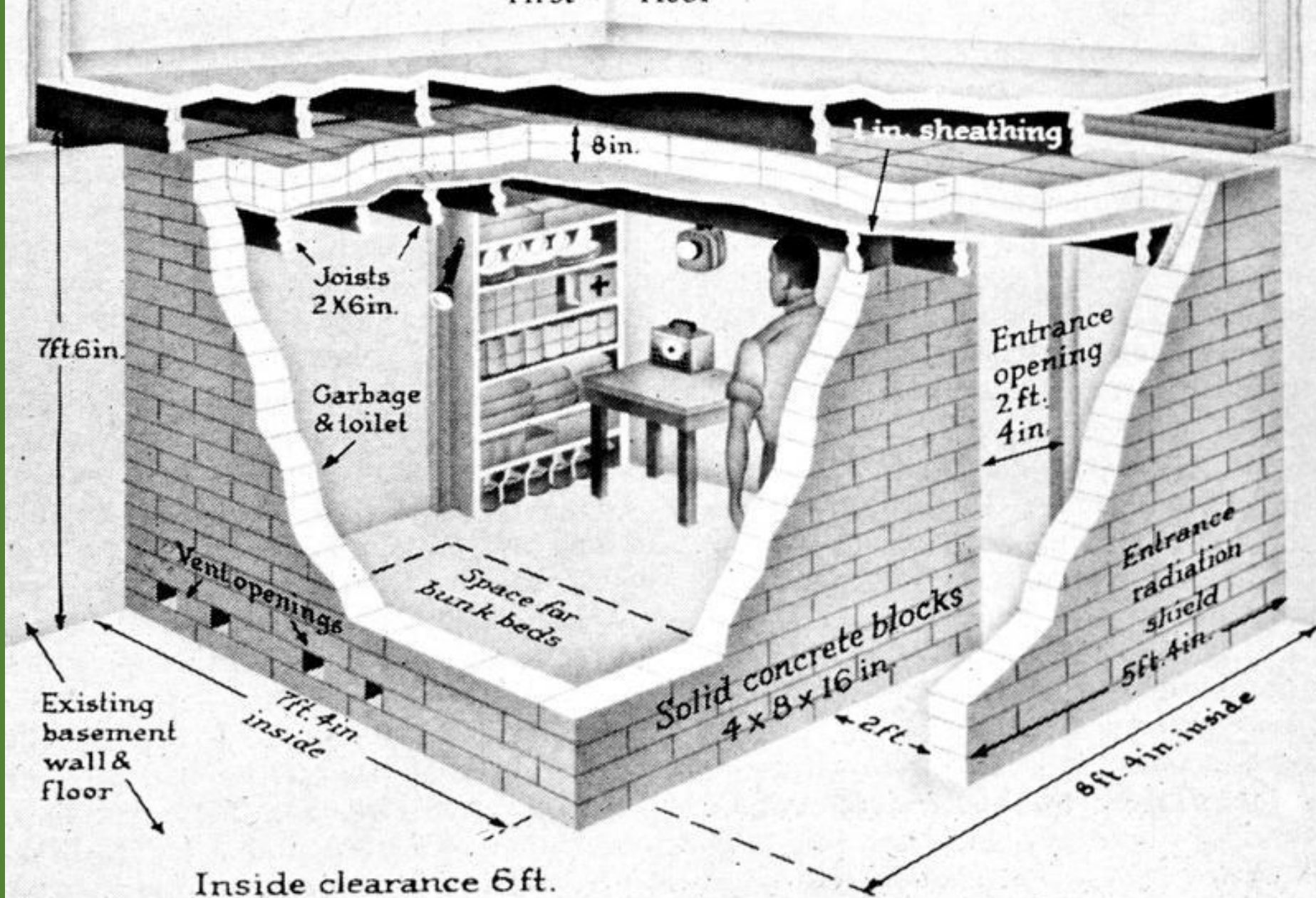
DIG SHALLOW DRAINAGE DITCH AROUND FILL.



DO-IT-YOURSELF SHELTER

(FALLOUT PROTECTION FOR SIX - \$150 to \$200)

First floor



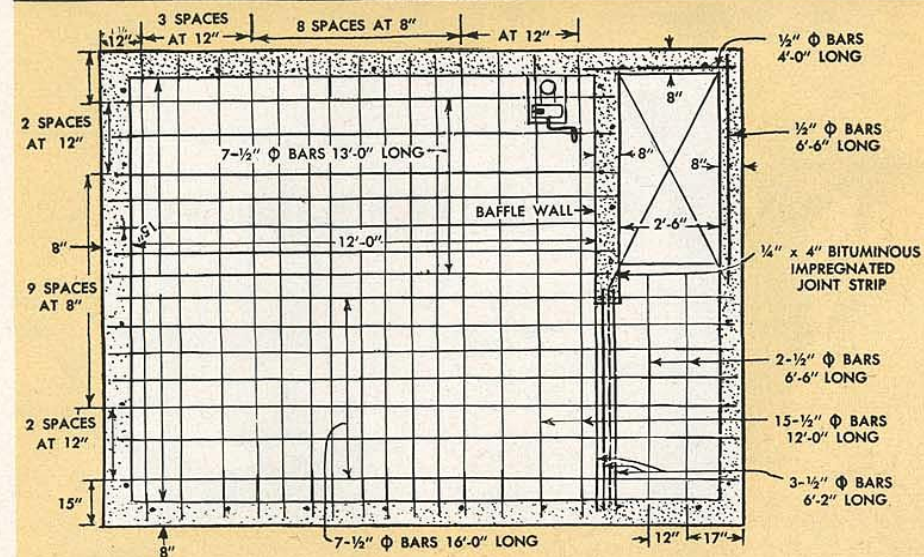
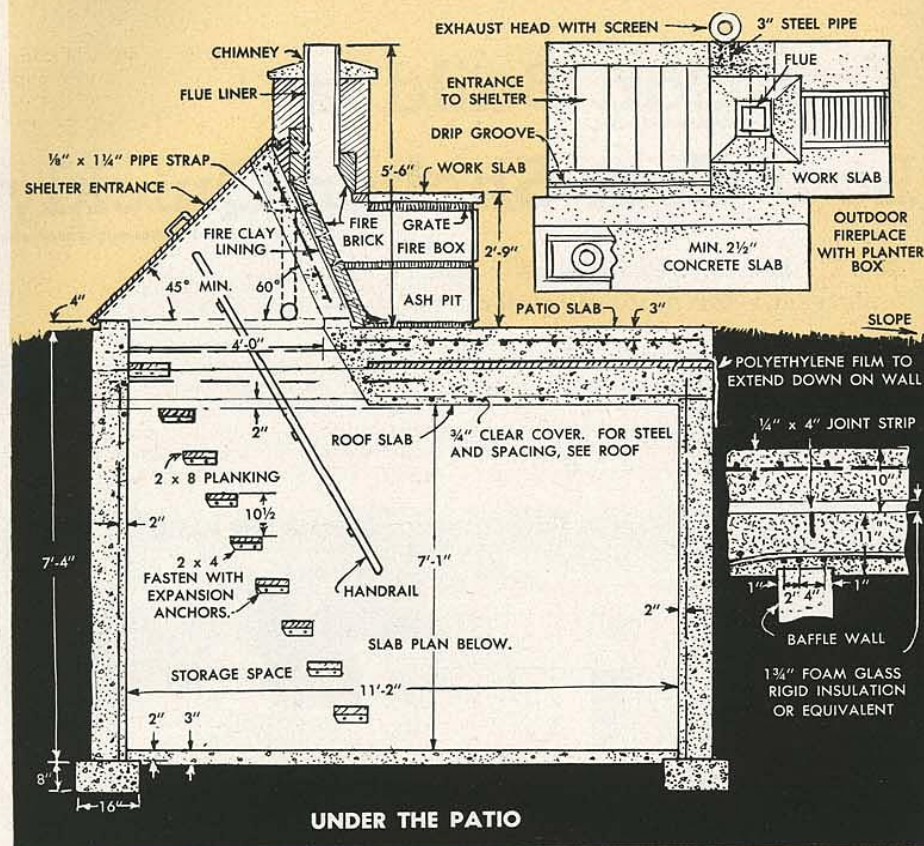
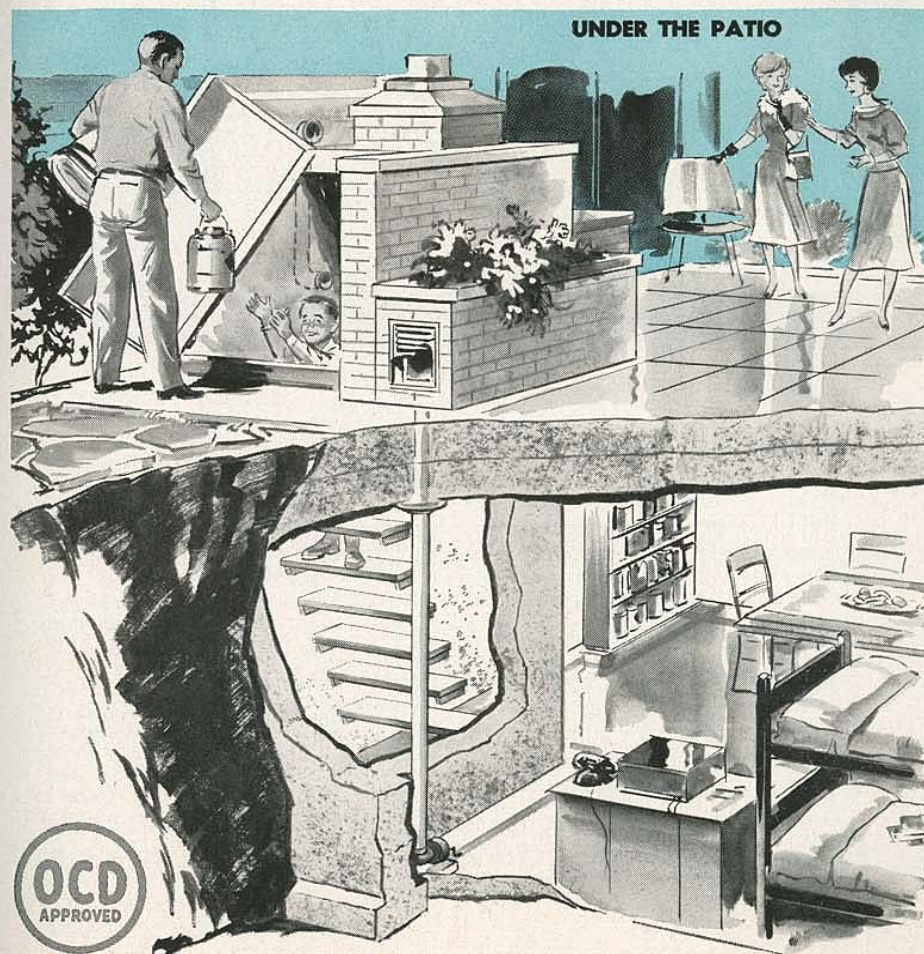
TIME Drawing by V. Puglisi

You Can Build a Low-Cost Shelter Quickly

\$30 . . . \$97 . . . \$280 — This can be the cost of materials for a family fallout shelter

NUCLEAR SCIENTISTS who have built shelters to protect their families against possible fallout radiation have, in many cases, put up simple, inexpensive structures that can be erected quickly. Following this example, *Popular Mechanics*

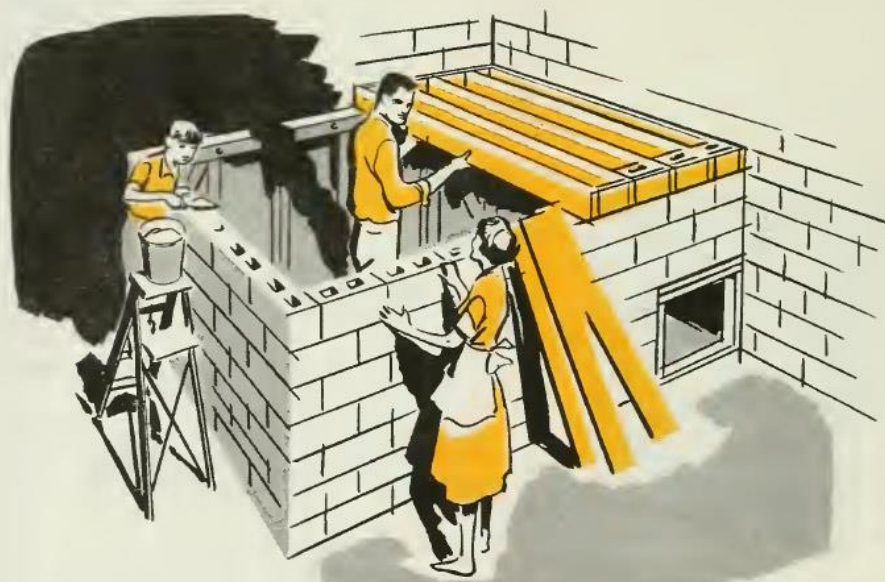
presents on these pages the construction details of three previously unpublished plans prepared by the office of Civil Defense and one by a nuclear engineer. They include some of the low-cost and most rapidly-built shelters available.



INDIVIDUAL ACTION: FAMILY SHELTERS

Families living in rural or sparsely settled areas may find that family shelters are the only feasible solution to their fallout shelter problem. Others may have personal preferences for family shelters.

There are a number of ways to construct home shelters. Several types are shown here. All of the shelters shown here can be built with about \$150 worth of materials or less. If materials, such as the lumber used in a basement lean-to shelter, are available at little or no cost, some persons could build these shelters for considerably less than \$150. In all of the shelters, the danger from fallout would be at least 100 times less than to unprotected persons.



Construction drawings on these and other family shelters can be obtained by following the instructions on the last page of this booklet.

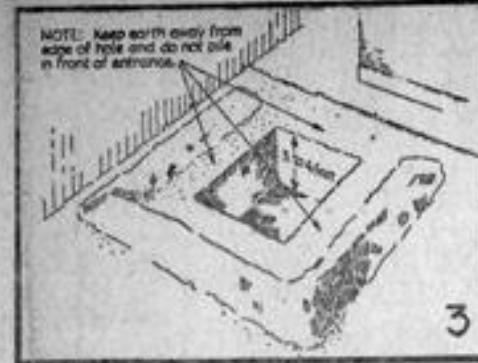
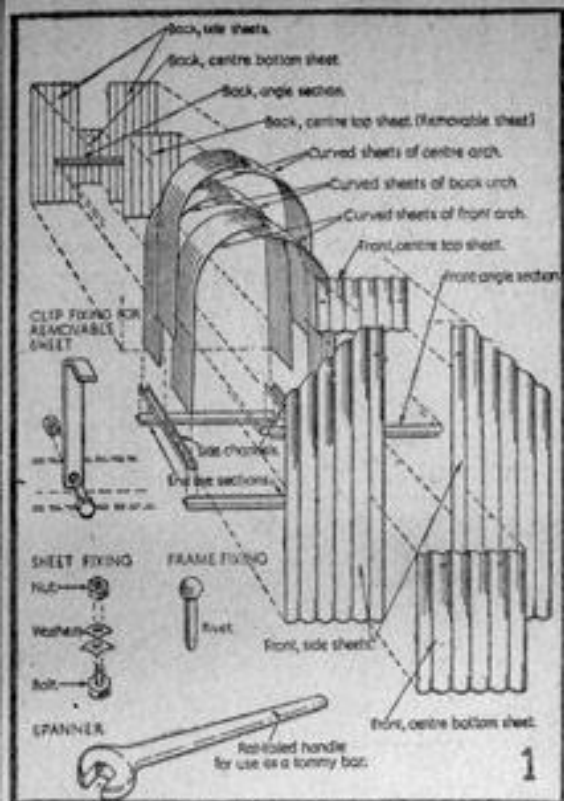
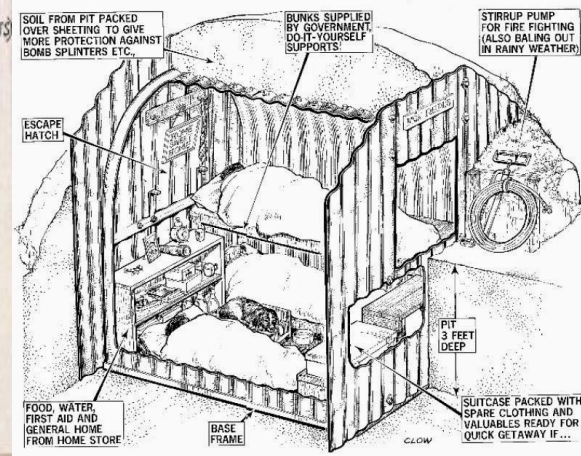
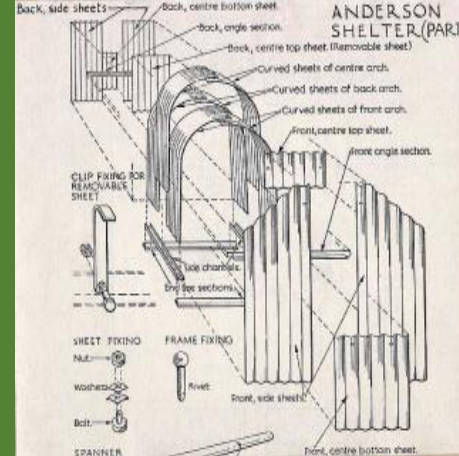
In selecting shielding material for any shelter, sand or earth can be substituted for concrete or brick, but for each inch of solid masonry you need an inch and a half of sand or earth. Adding shielding material to a shelter will improve the protection offered by the shelter, but it also may increase the cost of the shelter.



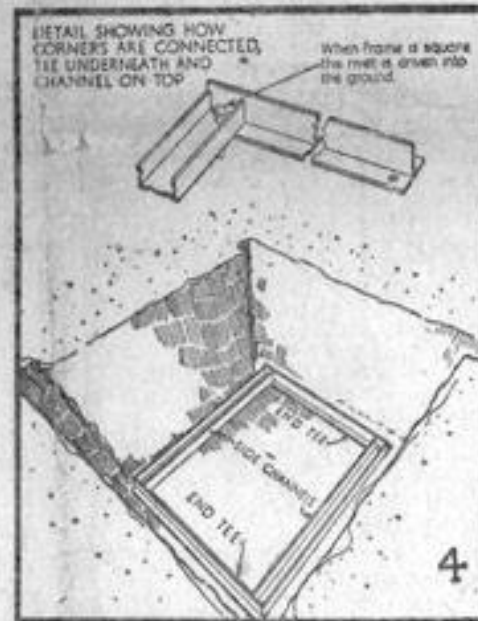
This sand-filled lean-to basement shelter will accommodate three persons. The house itself gives partial shielding. Sandbags are used to block the end of the shelter.



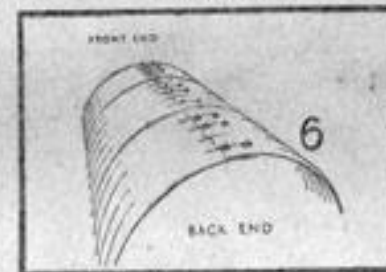
WWII British Anderson Shelter (Conventional bombs – could be converted to a fallout shelter)



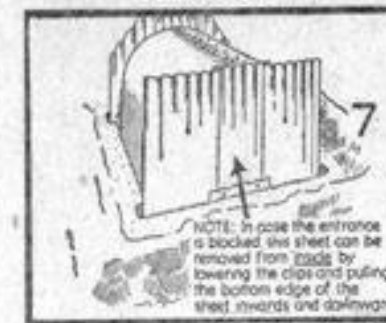
And here is the hole dug to its final depth.



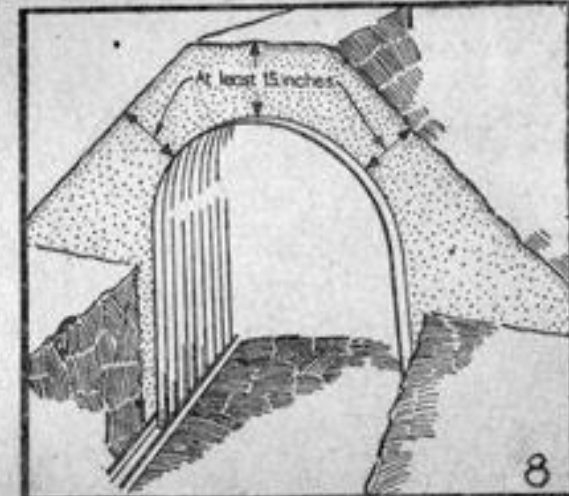
Next the frame is arranged at the bottom of the excavation.



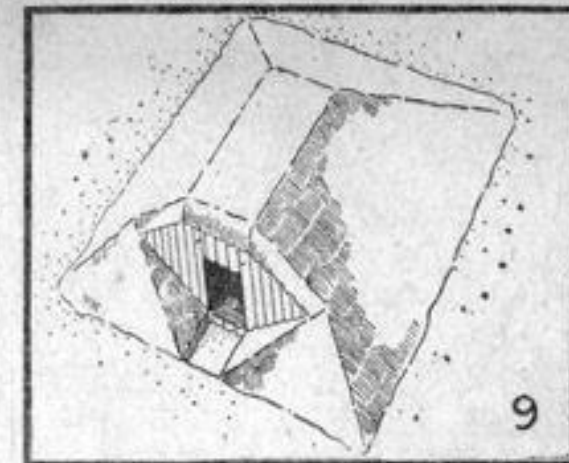
Top completed.



The back end of the shelter



Earth is tamped between metal and sides of excavation. Minimum over arch should be 15 inches.

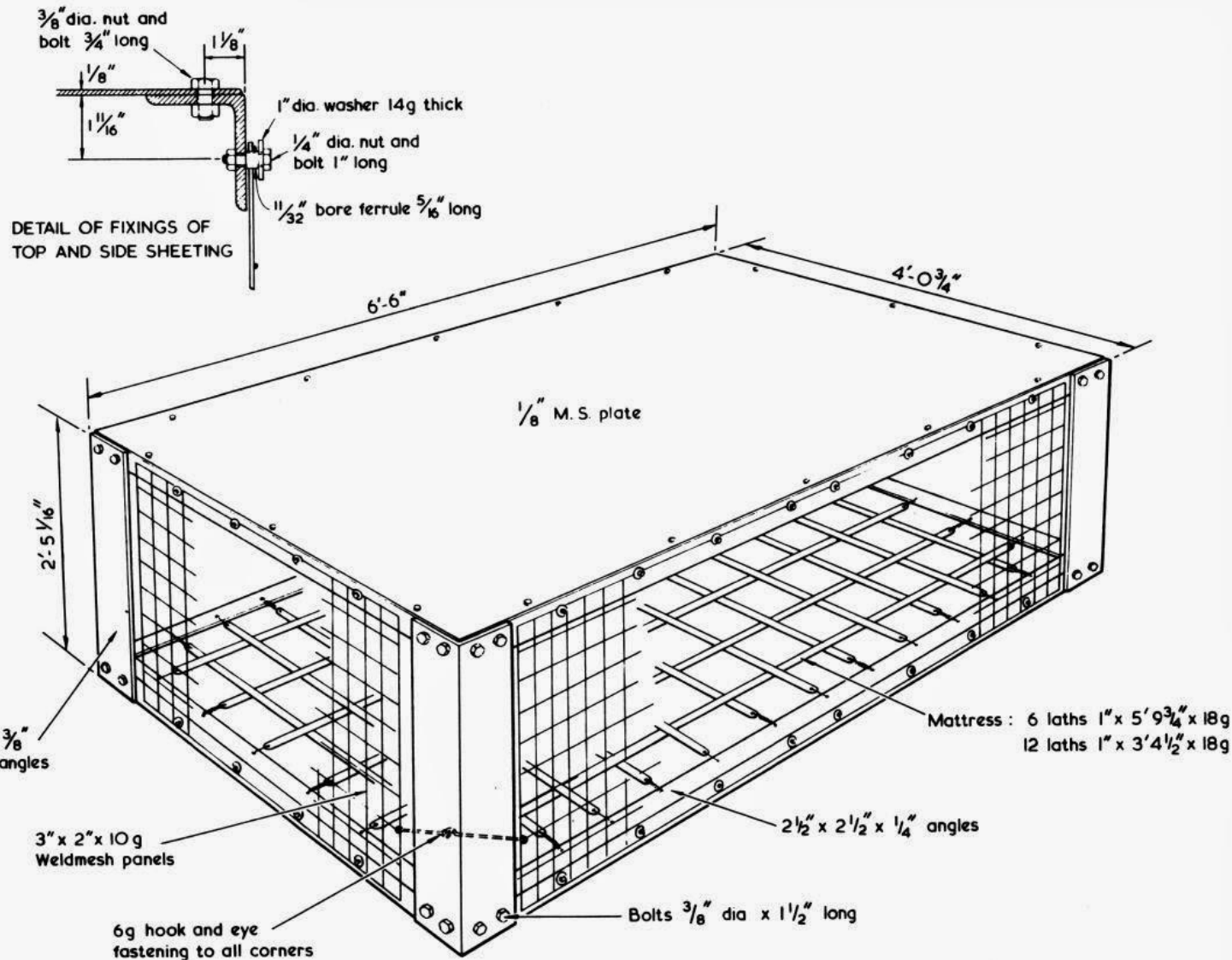


And so—the finished shelter, complete with earth cover.

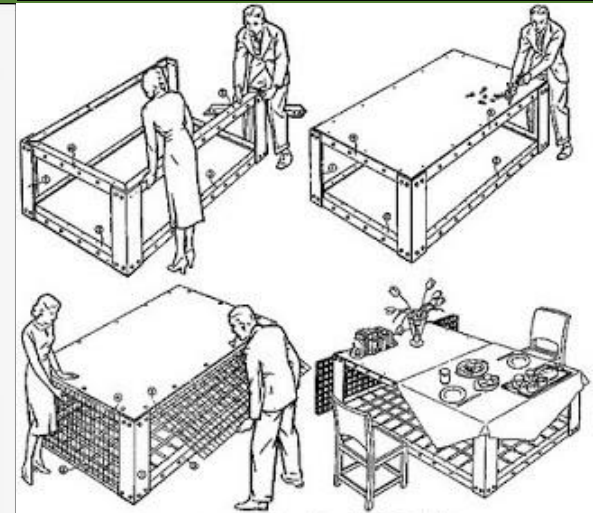
2 You see above the parts required for building the shelter...

Plot for digging is first pegged out (left).

WWII British Morrison Indoor Shelter (Conventional bombs only – not a fallout shelter)

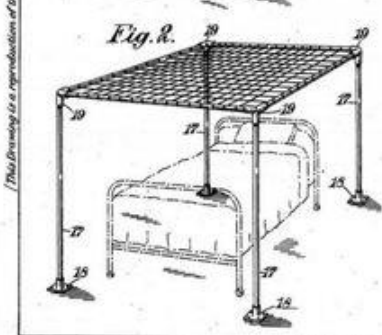
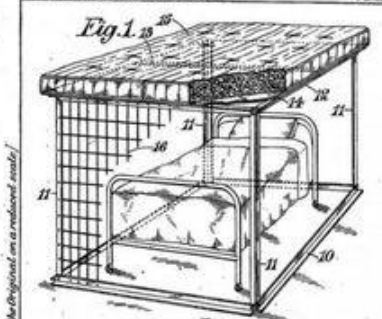


MORRISON SHELTER: FINAL DESIGN



How to put up your Morrison "Table" Shelter

544710 AMENDED SPECIFICATION 1 SHEET



Mulvey & Sons, Photo-Lith.



Basic First Aid ✓ Supplies

- 2 absorbent compress dressings (5 x 9 inches)
- 25 adhesive bandages (assorted sizes)
- 1 adhesive cloth tape (10 yards x 1 inch)
- 5 antibiotic ointment packets (approx. 1 gram)
- 5 antiseptic wipe packets
- 2 packets of aspirin (81 mg each)
- 1 blanket (space blanket)
- 1 breathing barrier (with one-way valve)
- 1 instant cold compress
- 2 pair of nonlatex gloves (size: large)
- 2 hydrocortisone ointment packets (1 gram each)
- Scissors
- 1 roller bandage (3 inches wide)
- 1 roller bandage (4 inches wide)
- 5 sterile gauze pads (3 x 3 inches)
- 5 sterile gauze pads (4 x 4 inches)
- Oral thermometer (non-mercury/nonglass)
- 2 triangular bandages
- Tweezers
- First aid instruction booklet
- courtesy of www.redcross.org/prepare



Smoke Bombs

- Using different colored dyes, smoke flares are used to signal for help during emergencies or create a screen to aid in escaping a hostile situation
- To make: melt 3 parts saltpeter and 2 parts granulated sugar in a metal saucepan on low; add any powdered dyes you wish and blend thoroughly; pour into prepared containers and add a fuse (string soaked in WD-40, left to dry) before the mixture hardens
- During emergencies the National Guard and EMS will likely see a lot of white and black colored smoke; if they see green, orange, red, purple smoke they'll definitely notice it



HOW TO MAKE A SMOKE BOMB



BY YUMI SAKUGAWA

YOU WILL NEED:



POTASSIUM NITRATE



SUGAR



A LIGHTER (PREFERABLY A LONGER ONE)

1 MIX TOGETHER 3 PARTS POTASSIUM NITRATE AND 2 PARTS SUGAR



2 *OPTIONAL: MIX IN 1 TEASPOON BAKING SODA FOR EVERY 5 TABLESPONS POTASSIUM NITRATE TO HELP MODERATE REACTION RATE



3 PUT MIXTURE IN SKILLET OR SAUCEPAN OVER LOW HEAT. USING A WOODEN SPOON, STIR THE MIXTURE



WARNING! DO NOT HEAT THE MIXTURE TOO QUICKLY OR IT WILL TURN BLACK AND POSSIBLY IGNITE

4 KEEP MIXING UNTIL MIXTURE TURNS TO A CONSISTENCY SIMILAR TO PEANUT BUTTER OR CARAMEL - THEN REMOVE PAN FROM HEAT



5 SPOON OUT MIXTURE ON TOP OF ALUMINUM FOIL LIKE COOKIE DOUGH



6 *OPTIONAL: YOU CAN MOLD IT TO DESIRED SHAPE WITH FOIL OR ADD A WICK OR FUSE BEFORE IT DRIES



BE SURE TO REMOVE FOIL OR MOLD BEFORE LIGHTING

7 ONCE THE BOMB HAS HARDENED COMPLETELY, PLACE IT IN AN OUTDOOR, WELL-VENTILATED SPACE AND DIRECTLY LIGHT THE BOMB OR LIGHT THE FUSE



8 STEP BACK AND ENJOY THE SMOKE SHOW



Materials:

Potassium Nitrate (finely ground)
Sugar
Baking soda
Cannon fuse (2 second/inch)
matchbox
sealable Monster drink can or large plastic container with lid
saucepan/heat source
duct tape
centerpunch or screwdriver



Optional:

food coloring powder (baking supply or spiceplace.com)
concentrated wasabi powder (spiceplace.com)
sulfur powder

Cut a good 3 to 4 inches of cannon fuse. Keep nearby. Mix 40% sugar to 60% potassium nitrate with a teaspoon of baking soda to every 2 cups of mix. Add to saucepan. Heat VERY gently, increasing the heat slowly. Mix constantly. Mixture will begin to clump, then spots will begin to brown.

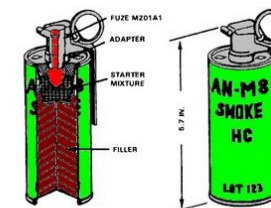


When it reduces to a consistency of pancake batter, remove from heat. Carefully pour into your selected shell until it is 9/10s full. Wipe excess away from shell if mixture rises over the edge. Add your fuse so 1/2 of it is above the level of the mixture. Allow to cool and harden.

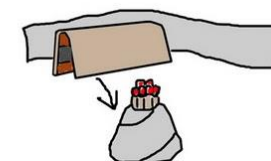


Punch a hole through the middle of your can/container lid. thread fuse through and secure the lid. You can hot glue around the fuse and around the lid to seal it against humidity.

Lay a strip of duct tape out and evenly space 5 wooden matches about 1mm apart. Tightly wrap around the cannon fuse so that the match tips surround the end of the fuse. Apply a butt ton of duct tape, securing the match fuse assembly to the shell in a conical formation, careful to leave the match heads exposed. This is to stabilize, strengthen, and weatherproof it to a degree



Fold a strip of the matchbox with the strikeface so that it resembles an angular U shape. Place tightly around the match head/fuse assembly and tape it up completely so that there is no gaps within the cardboard tab you just made. The tab should not fall off when rolled upside down, but come off when pulled on. (DO NOT DO THIS) Add a safety system by adding a rubber band or fastening a single piece of electrical tape over the pull-tab to the main shell.



The pull tab fuse is NOT weatherproof, so keep it dry. And a year or so in humid weather ill probably mean you need to replace the matches and tape, but the cannon fuse and the rest is sealed and should be okay.

Optional:

Colored Smoke Grenade: Make your mix 60% potassium nitrate, 30% sugar, and 10% powdered food coloring.

Irritant Gas grenade: Make your mix 50% potassium nitrate, 30% sugar, and 20% concentrated wasabi powder.



-Poison- Gas Grenade: Make your mix 60% potassium nitrate and 40% sulfur. Add no baking soda. **WARNING:** this mixture produces very high levels of pure hydrogen sulfide gas, which is quickly lethal in enclosed spaces.



by OSWALD

Bug Out Bag / 96-Hour Kit

- When evacuation becomes necessary, it's best to have a emergency kit of some kind you can grab and go with all the necessities of life and means to carry on with life afterwards
- A 96-hour kit contains everything needed for an evacuation in a natural or man-made disaster where there will eventually be Red Cross, FEMA, or National Guard shelters set up; unfortunately, with the last several emergency situations in many states have shown, help may not be available for weeks/months out if any comes at all
- A bug out bag is a 96-hour kit with the addition of firearms, clothes, and some long-term survival tools in case of civil upheaval and conflicts; one of these kits does technically classify you a combatant, so be careful



The Home Guard / Civil Defense

- An old-fashioned notion from previous wars and the Cold War may have a resurgence due to rising civil unrest and international tensions; we do not know if things will get to this point here, but best to have some awareness
- Home Guardsmen were usually unorganized militia of companies in 25 – 300 local men and women over 18 years old for a district of 1000 people; these were military veterans or draftee's not fit enough for the regular army, but good enough to operate close to home; there was a regular military Area Captain or Commander and then lower ranks of civilians
- Civil Defense served as local HAM Radio communications, lookouts, air raid and blackout wardens, and first responders/first-aid personnel; the Civil Defense Office of the Cold War was reorganized in the 1990's into FEMA; anyone can still get training as a first responder through the CERT Program; the military also has a HAM Radio emergency operator's program called MARS civilians can join

More info at <https://www.utah.gov/beready/index.html>

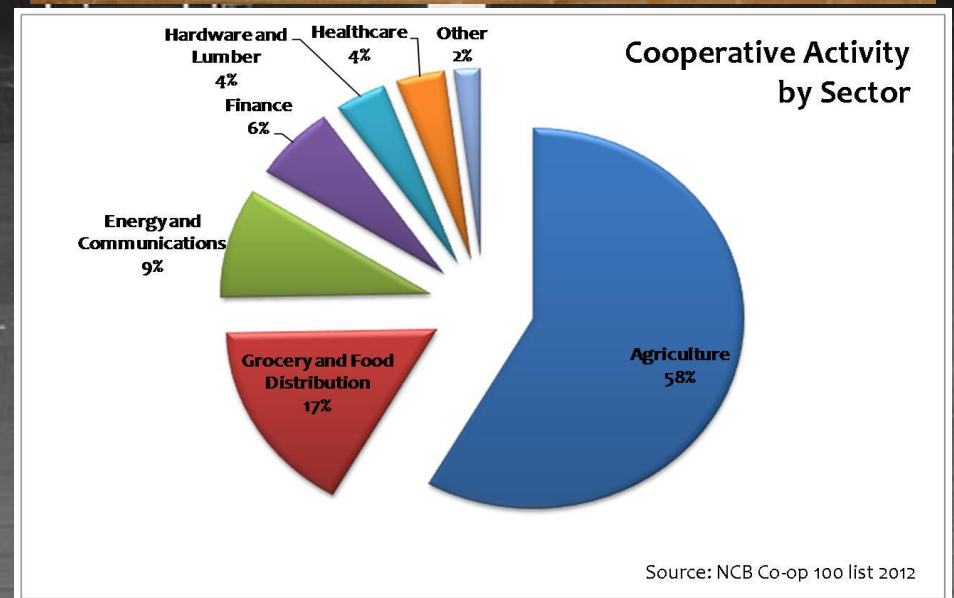
http://www.fema.gov/pdf/areyouready/areyouready_full.pdf

<https://www.mars.af.mil/Portals/59/documents/MARS%20Guide%20to%20new%20Membership%20v1.pdf>



Non-Profit Cooperatives

- In old Deseret, the Church owned many corporations that were operated as cooperatives (ZCMI, for example); in the 1990's, the IRS and Congress decided to raise taxes and restrictions on Church owned public corporations in a bid to raise revenue and flex their muscles, so many of the Church owned corporations were sold off
- However, this doesn't restrict Church members getting together separate from Church Authority and forming non-profit cooperatives, also called co-op's, for discounted group purchasing, non-profit businesses, and as a means of overcoming unfair business practices
- There are a lot of rules and by-laws that come into play, and creating a co-op is more than just some neighbors signing a document and paying in a little funds



What is a Cooperative?

- Non-profit cooperatives (co-ops) are business entities communities use to get access to goods and services that are otherwise inaccessible for consumers, and can also make an income for its members

- This list is a set of comprehensive cooperative principles used by the first co-ops; characteristics that distinguish cooperatives from non-cooperative businesses:

- Open membership
- One member, one vote
- Cash trading
- Membership education
- Political and religious neutrality
- No unusual risk assumption
- Limitation on the number of shares owned
- Limited interest on stock
- Goods sold at regular retail prices
- Net margins distributed to members

- The USDA published a free manual to help start, manage, and maintain cooperatives:

<https://www.rd.usda.gov/files/cir55.pdf>



What's the Difference Between Co-ops and Conventional Enterprises?

Members/Stakeholders vs. Stockholders

Member-owned vs. Investor-owned

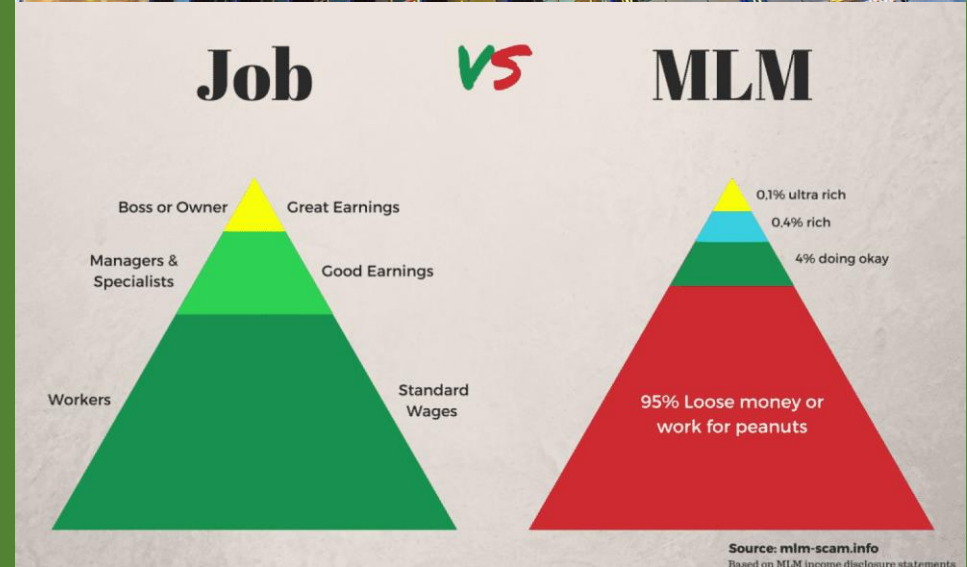
Service objective vs. Profit objective

Internationally accepted guiding principles and values

Only legal form of corporation designed to support multiple objectives

What Cooperatives Are Not

- C and S corporations: there won't be any initial public offerings, or any attachment to the stock market whatsoever; this does limit how much a co-op can raise in capital, but does protect it from some market forces that ravish communities
- Multi-level marketing: this not like Beachbody, Herbalife, Amway, or any of those types of companies; the margins do not ship out to the head of the pyramid, it stays within and benefits the community
- Cooperatives are not communist or socialist as it's not controlled by an oligarchy, and not compulsory – members should have the right to pull out their assets and leave anytime without any concern of reprisals; they are also not social welfare programs and all transactions should be treated as business transactions



We already have the culture for co-ops

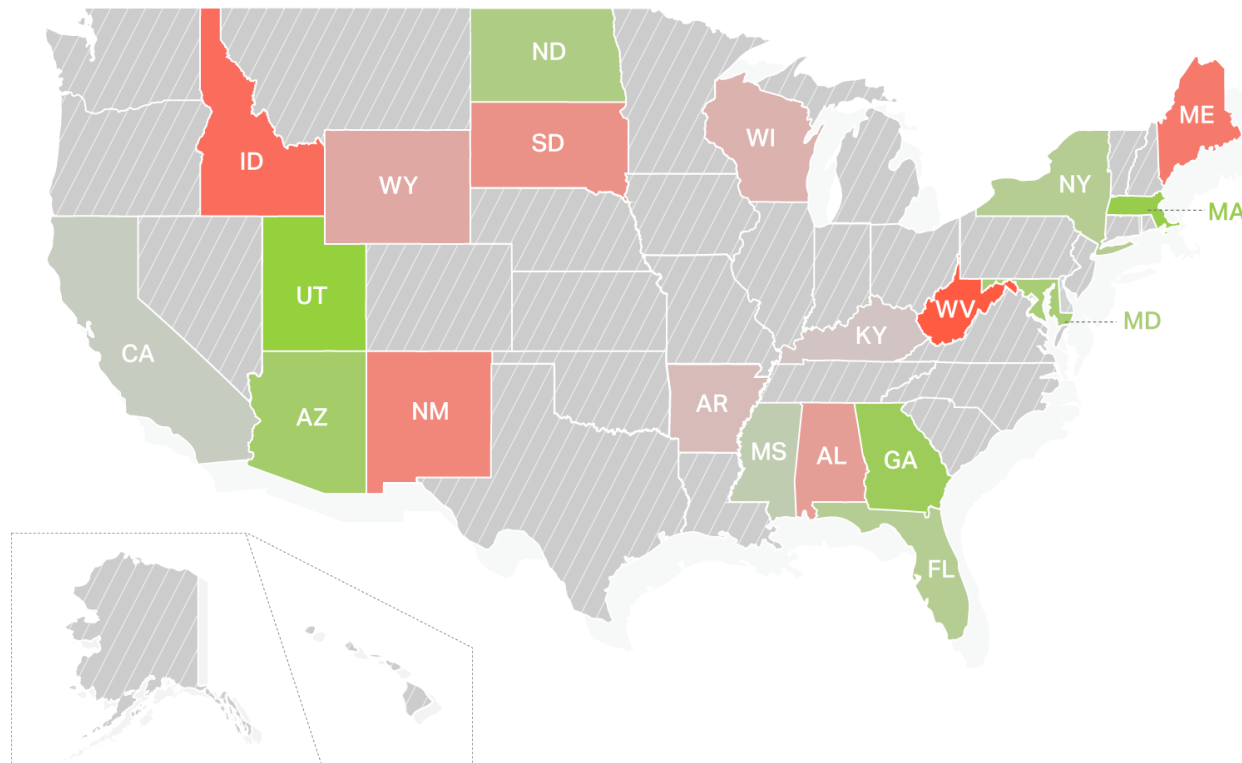


THE *Cooperative* STATES OF AMERICA

Sokanu's career test defines cooperativeness as "being pleasant with others on the job; displaying a good-natured, cooperative attitude." The most cooperative states in all of America were revealed in a study of **300,000 individuals**.

MOST COOPERATIVE

- 1 Utah
- 2 Massachusetts
- 3 Georgia
- 4 Arizona
- 5 Maryland
- 6 North Dakota
- 7 Florida
- 8 New York
- 9 Mississippi
- 10 California



LEAST COOPERATIVE

- 41 Kentucky
- 42 Arkansas
- 43 Wisconsin
- 44 Wyoming
- 45 Alabama
- 46 South Dakota
- 47 New Mexico
- 48 Maine
- 49 Idaho
- 50 West Virginia

sokanu

www.sokanu.com/career-test

Seven Cooperative Principles

VOLUNTARY AND OPEN MEMBERSHIP

Cooperatives are voluntary organizations open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.

DEMOCRATIC MEMBER CONTROL

Cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are organized in a democratic manner.

MEMBERS' ECONOMIC PARTICIPATION

Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefitting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.

AUTONOMY AND INDEPENDENCE

Cooperatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.

EDUCATION, TRAINING AND INFORMATION

Cooperatives provide education and training for their members, elected representatives, managers, and employees so that they can contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.

COOPERATION AMONG COOPERATIVES

Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional and international structures.

CONCERN FOR COMMUNITY

While focusing on member needs, cooperatives work for the sustainable development of their communities through policies accepted by their members.

Types of Cooperatives

- Credit Cooperative: promotes saving and lending services to members (like a credit union)
- Consumer Cooperative: procures and distributes commodities to members and non-members to purchase
- Producers Cooperative: undertakes the processing and manufacturing of raw materials into finished goods for members and non-members to purchase
- Marketing Cooperative: formed by members to promote and bring awareness to the community's goods and services
- Medical Cooperative: organized by members to hire medical staff, create hospitals, dental offices, and handle billing and coding
- Energy Cooperatives: purchases fuel (gasoline, propane, CNG, coal), electrical generators, or even build power plants for members and non-members to purchase heat and power from
- Agricultural Cooperative: in our area would pool resources to build greenhouses, hydroponic farms, a small livestock ranch to grow and process foods for members and non-members to purchase
- Education Cooperative: owns and operates licensed schools and educational equipment for members
- Insurance Cooperative: pools resources of members and hires an actuary for better insurance coverage
- Advocacy Cooperative: this is a primary organization which promotes and advocates for cooperativism among members and the public; operates training, awareness campaigns, communications, and outreach
- Multipurpose Cooperative: combines two or more of the business activities of the cooperatives listed
- The list is very long...

What type of businesses make good worker cooperatives?

- Accounting firms
- Antique stores
- Appliance stores
- Appraisers
- Architectural firms
- Art Galleries
- Auto repair
- Bakeries
- Banks
- Batting cages
- Bed & Breakfasts
- Beekeepers
- Bicycle shop
- Building supply stores
- Business supplies
- Butchers
- Car dealerships
- Car washes
- Carpentry shop
- Cemeteries
- Clothing store
- Computer repair
- Construction contractors
- Consultants firm
- Convenience stores
- Craft supply stores
- Cyber Cafe
- Dance studios
- Daycare centers
- Deli products
- Delivery services
- Drycleaners
- Entertainment agents
- Event Coordinators
- Farmer's markets
- Feed stores
- Fish market
- Formal wear rentals
- Furniture stores
- Gas stations
- General stores
- Graphics and web design
- Grocery stores
- Groomers
- Gun shop
- Hotels
- Housecleaning business
- Housesitting services
- Insurance sales
- Jewelry stores
- Kitchenware stores
- Landscapers
- Laundromats
- Law firms
- Lending locations
- Medical & Dental care
- Miniature Golf
- Motels
- Network business
- Newspapers
- Nurseries
- Office rental services
- Office supplies
- Optometrist
- Painters
- Party rentals
- Pet stores
- Pharmacies
- Photographers
- Pottery stores
- Print shops
- Recycle-Upcycle shops
- Rental yards
- Repair shops
- Restaurants
- Retail stores
- Roof Installations
- Secretarial services
- Senior care assistance
- Shipping services
- Shoe stores
- Sign painters
- Sporting goods store
- Storage units
- Theatres
- Tile & Flooring stores
- Training centers
- Transportation services
- Travel agencies
- Trophy stores
- Warehouse rental

Benefits of a co-op

- Brings in needed supplies and services to a community that other for-profit businesses will not venture into, at a reasonable price for consumers; also creates jobs and new opportunities locally that otherwise wouldn't exist (for example, a co-op established to build a hydroponic greenhouse on a vacant lot brings lower cost fresh foods to the area, creates local jobs for the unemployed, and is owned by neighbors rather than a company that could pull up roots anytime)
- Creates production plants and retail outlets that are only locally concerned rather than nationally or internationally; following a community's social norms, these co-op retailers can carry goods and provide services that do not impede or coerce the local population into unnecessary exposure to vices and compromises (such as choosing to not sell cigarettes, alcoholic beverages, or pornography, and could close on Sundays)
- Members receive dividends from the distribution of profits on a steady basis; surplus could also be distributed to members if that's part of the organizations by-laws
- Co-ops are democratic in nature and every member has a vote in the direction the co-op takes
- Creates competition in the commerce sector of our community – inevitably lowering prices and increasing service as businesses compete for market share



Differences between a Corporation and a Cooperative

Corporation	Retailers' Cooperative
Shares are purchased	Memberships are purchased
Dividends are distributed to shareholders	Dividends are distributed to members
Share holders vote on issues: One vote per share	Members vote on issues: One vote per membership
Products and services are sold <i>for profit</i> to the public	<ul style="list-style-type: none"> • Business services are given to the members • Products are sold to members at a <i>not for profit</i> price
Mandate is to make <i>the corporation</i> more profitable	Mandate is to make <i>your business</i> more profitable

ADVANTAGES

- ▶ Easy formation
- ▶ Open membership
- ▶ Democratic control
- ▶ Limited liability
- ▶ Elimination of middleman's profits
- ▶ State control
- ▶ Stable life
- ▶ Voluntary Organisation
- ▶ Sources of Finance
- ▶ Separate Legal Entity
- ▶ Distribution of Surplus
- ▶ Self-help through mutual cooperation
- ▶ State control

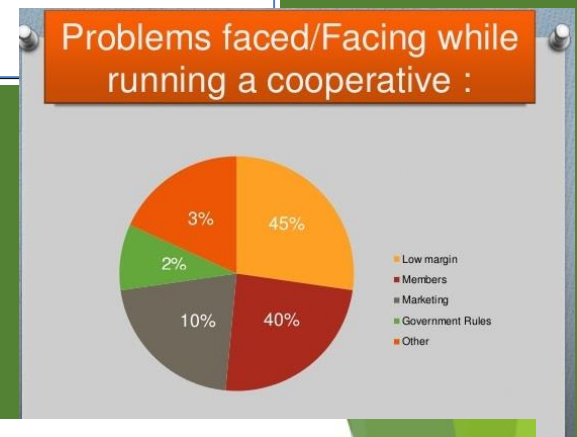
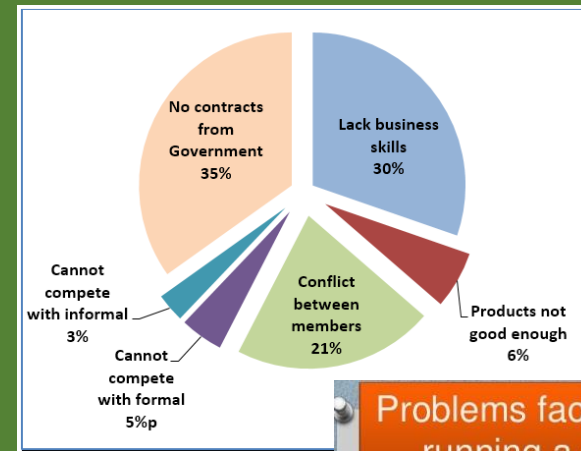


Top 100 Largest Agricultural Cooperatives – rank, name, type, total business volume and total assets, 2014 and 2013

2014	2013			2014 Business volume (\$ billions)	2013 Business volume (\$ billions)	2014 Total assets (\$ billions)	2013 Total assets (\$ billions)
Rank	Rank	Name	Type				
1	1	CHS Inc. Inver Grove Heights, Minn.	Mixed (Energy, Supply, Food, Grain)	42.886	44.480	15.147	13.504
2	3	Dairy Farmers of America Kansas City, Mo.	Dairy	17.856	12.879	3.404	2.641
3	2	Land O'Lakes Inc. Saint Paul, Minn.	Mixed (Supply, Dairy, Food)	15.276	14.287	6.992	6.758
4	4	GROWMARK Inc. Bloomington, Ill.	Supply	10.433	10.236	2.459	2.366
5	5	Ag Processing Inc. Omaha, Neb.	Mixed (Supply, Grain)	5.200	5.678	1.376	1.348
6	6	California Dairies Inc. Artesia, Calif.	Dairy	4.642	3.857	1.112	0.894
7	7	United Suppliers Inc. Eldora, Iowa	Supply	2.642	2.673	1.129	1.097
8	10	Northwest Dairy Association Seattle, Wash.	Dairy	2.595	2.243	0.644	0.632
9		<i>Name withheld by request</i>					
10	12	Associated Milk Producers Inc. New Ulm, Minn.	Dairy	2.170	1.784	0.312	0.315

Drawbacks of co-ops

- As with any commercial venture there is risk involved: miscalculating the community's need for production plants, services, and retailers that results in the co-op costing more to operate than it brings in; mismanagement and hiring unscrupulous employees; limited capital as compared to corporations; divisions and rifts between members that makes operations difficult; changes in national and municipal laws and regulations – the list goes on
- Non-profits follow a specific set of IRS rules and regulations; the violations of which can lead to pulled licenses, fines, and even imprisonment; these rules can sometimes make a co-op dependent on government for loans, income, and control
- Since profits are split between the members instead of automatically going back into the co-op it's the responsibility of every member to reinvest, and some may choose to opt out after a few returns
- Possible litigation from for-profit businesses in the area seeking economic protections – this is a lot more common than one would think
- Changing demographics affect the functioning of a co-op; always keep an eye out for these changes and adapt as necessary



LIMITATION



- ▶ Limited capital
- ▶ Problems in management
- ▶ Lack of motivation
- ▶ Lack of cooperation
- ▶ Dependence on government
- ▶ Lack in commitment
- ▶ Poor infrastructure
- ▶ Lack of awareness
- ▶ Lack of quality management
- ▶ Dormant membership
- ▶ Cooperatives are also unable to evolve strong communication and public relations strategies which can promote the concept of cooperation among the masses.

Steps to Starting a Co-op

- There are five questions that must be answered by all involved in starting a co-op; if any of the answers is no then it's best not to start one until all answers are yes:
 - Is there an economic need?
 - Can a cooperative provide a solution?
 - Is there member interest?
 - Is the proposed co-op plan feasible?
 - Do members commit capital and business volume (are resources available)?
- This is not something to take lightly as mistakes and unscrupulous members can result in fines and possible prosecution



Membership

- Co-ops are owned and operated by their members, who are also shareholders (this is very different than, say a Costco membership); it is the responsibility of members to promote and protect the interests and objectives of the cooperative; each member has a deciding vote in what direction the co-op goes in and votes in/out the board of directors (this includes all members who are employees and management)
- As previously mentioned, members are expected to contribute to the co-op in investments, time and talents, providing equipment, and anything else necessary for the success of the venture
- Non-members are allowed and encouraged to patron the cooperative and enjoy all the benefits as consumers, and hopefully become members themselves; and members helping each other to improve our community
- Best to create a questionnaire for prospective members to fill out that shows what they can bring to the cooperative



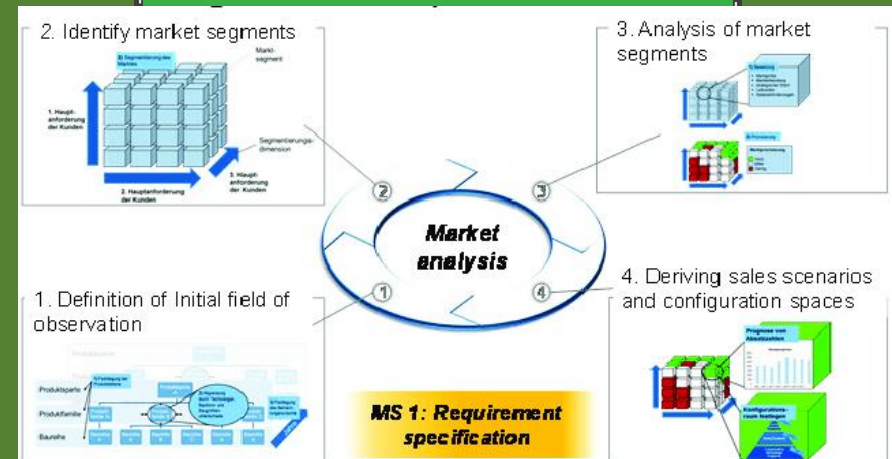
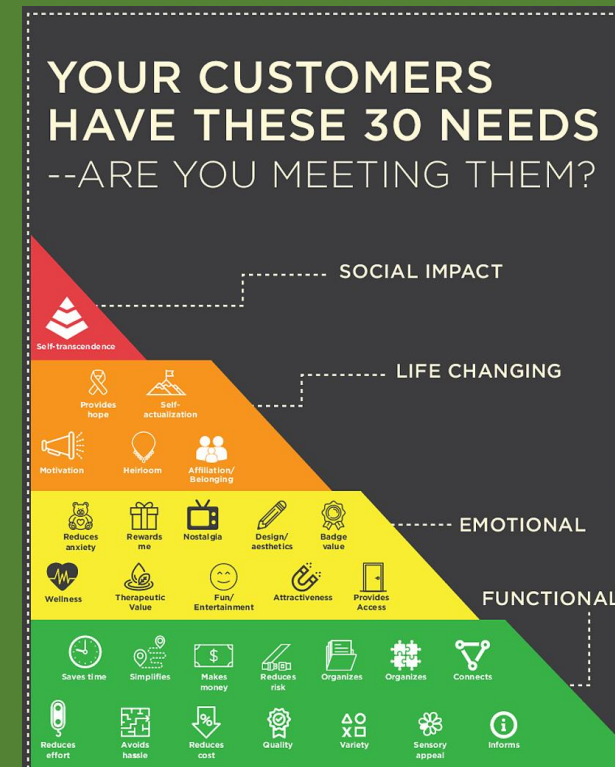
Is there an economic need?

- An economic need is something as simple as high retail prices, pre-existing lack of development and services, discrimination (this is one of the big reasons the Saints began ZCMI), or economic depression closing access to goods and services
- Best to convene a group of at least 10 neighbors or more as exploratory committee members:
 - What information about the perceived need is readily available?
 - Could a cooperative effort address this need?
 - What information about cooperatives is available?
 - Who can serve as an adviser to the group?
 - Who should be invited to a meeting of potential users?
 - How should potential users be contacted?
- If all answers from the exploratory committee are appropriate and positive, this group should form a Steering Committee for the next step



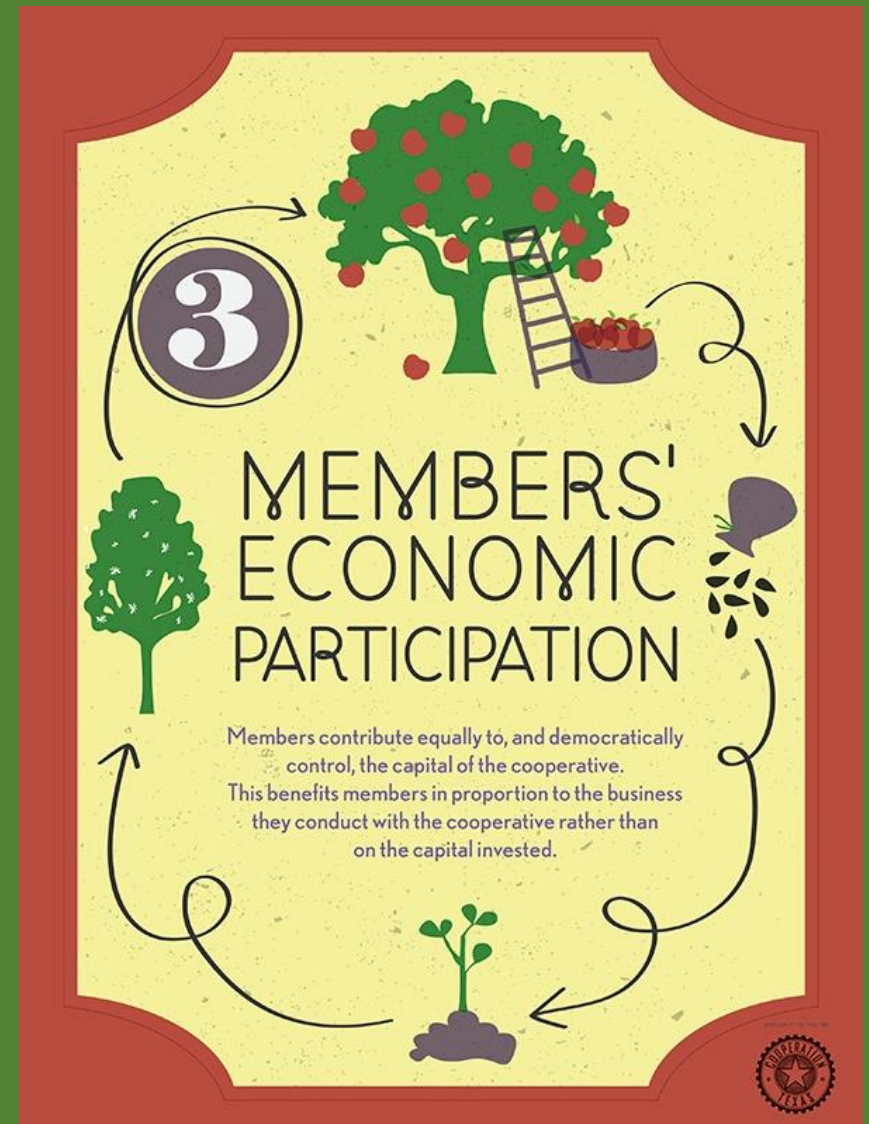
Can a cooperative provide a solution?

- When the prospective members get to this point it's time to form a Steering Committee made of folks with an interest in the cooperative and have sound business judgement; this committee will decide the feasibility of the proposed cooperative and write up the specific, detailed business plan
- This committee should consult with specialists in business, law, finance, and with folks who've started successful co-ops; gather all empirical information as possible before making any decisions; talk with more than one specialist as each will have very different experiences and information to offer
- Two major studies must be done by this committee: a member use analysis and an initial market analysis

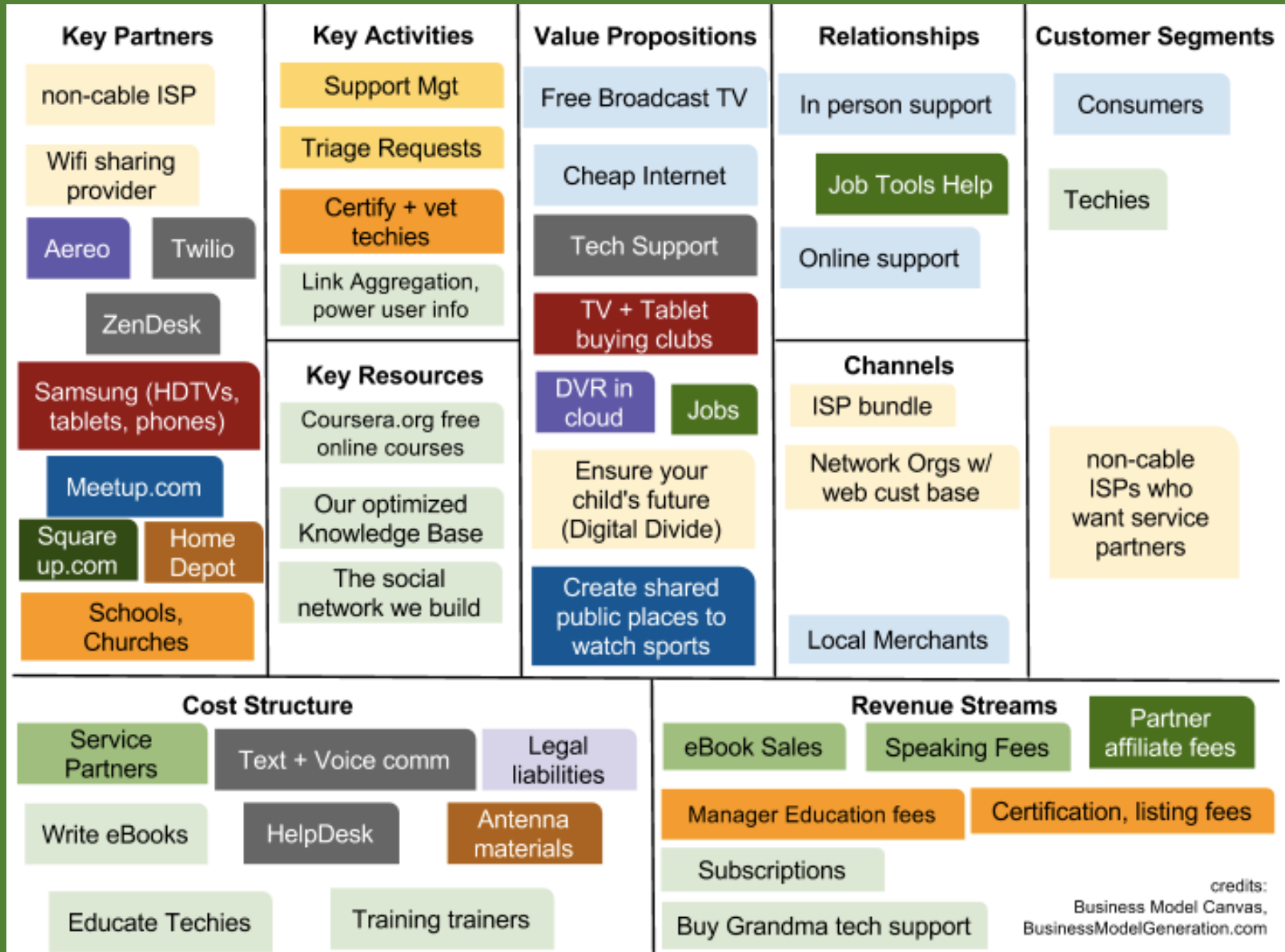


Is there member interest?

- The Steering Committee should put together the member use analysis and an initial market analysis by surveying potential members; member use analysis questions should include: the members needs, anticipated business volume, characteristics of prospective members (what are their views and feelings about cooperatives and would they participate as members of one), and what location(s) are best; The analysis will identify which activities are appropriate, business volume, and financial capabilities of the potential cooperative members; the Steering Committee should review the data gathered and decide whether to proceed from here
- The initial market analysis identifies and examines current market conditions to provide insight into appropriate activities for the cooperative, volume, facility, technological needs, and other pertinent factors; the Utah Small Business Association does these for a fee; if all the data looks favorable then a second exploratory committee should convene with all surveyed potential members (should be a greater number than the first exploratory committee)



Example of a business model canvas



Writing a Business Plan

- The Steering Committee should write the business plan at this point
- Business plans are necessary for attracting more members as confidence in the plan is vital, and securing capital and loans later in the process
- Include the member use analysis and an initial market analysis data and results – this is the majority of the plans justification; include management, operational, and financial plans
- Be as specific as possible on what's planned, how it will be accomplished, and when with deadlines and accountability included

Business Plan Outline **The Writing a Business Plan Series** **By Susan Ward**

Business Plan

Thinking of writing a business plan? Here is a business plan outline, listing the sections in the order in which they will appear in your completed plan with a brief explanation of each section to help you get organized and guide you through the process.

The Executive Summary¹

While appearing first, this section is written last. It summarizes the key elements of the entire business plan. ([Executive Summary Example²](#))

The Industry³

An overview of the industry sector that your business will be a part of, including industry trends, major players in the industry, and estimated industry sales. This section will also include a summary of your business's place within the industry. ([Business Plan Example: Industry Section⁴](#))

Market Analysis⁵

An examination of the primary target market for your product or service, including geographic location, demographics, your target market's needs and how these needs are being met currently.

Competitive Analysis⁶

An investigation of your direct and indirect competitors, with an assessment of their competitive advantage and an analysis of how you will overcome any entry barriers to your chosen market.

Marketing Plan⁷

A detailed explanation of your sales strategy, pricing plan, proposed advertising and promotion activities, and product or service's benefits.

Management Plan⁸

An outline of your business's legal structure and management resources, including your internal management team, external management resources, and human resources needs.

Operating Plan⁹

A description of your business's physical location, facilities and equipment, kinds of employees needed, inventory requirements and suppliers, and any other applicable operating details, such as a description of the manufacturing process.

Financial Plan¹⁰

A description of your funding requirements, your detailed financial statements, and a financial statement analysis.

Appendices And Exhibits

Any additional information that will help establish the credibility of your business idea, such as marketing studies, photographs of your product, and/or contracts or other legal agreements pertinent to your business.

Articles of Incorporations

In Utah, all articles of incorporations for cooperatives must have:

- The name of the corporation
- The business purpose or purposes of organizing the corporations, including important language required by the IRS for federal tax exemption
- The number of shares the corporation is authorized to issue. If more than one class of shares is authorized, each class must be designated along with a description of the preferences, limitations and relative rights of each class. For additional information, see Title 16-6a-202 of the Utah Code
- A statement declaring whether or not the corporation will have "voting members"
- The number of directors constituting the initial governing board {at least three (3)} and may list the name of each of those directors (optional with Articles until first annual report)
- The Utah street address of the corporation's registered office and the name of the registered agent at that address accepting appointment as registered agent
- The name, street addresses and verified signatures of each incorporators (members)
- The street address for the principle office (optional with Articles until first annual report)

When the articles are ready have the Steering Committee bring it to the members for approval

ARTICLES OF INCORPORATION SAMPLE OF ST. CLOUD ANTIQUE AUTOMOBILE CLUB, INC.

The undersigned for the purpose of forming a corporation pursuant to Chapter 317 of the Minnesota Statute Annotated, do hereby adopt the following Articles of Incorporation:

ARTICLE I. The name of this corporation is St. CloudAntique Automobile Club, Incorporated.

ARTICLE II. The purpose of the corporation is to have and exercise all powers for which a non-profit corporation is eligible under the provisions of Chapter 317 of the MinnesotaStatutes Annotated, and as the same may be amended, includingbut not limited to recreational, social, historical, educational, and activities of a like nature related to automobiles, automotive history, the preservation of automobiles and automotive artifacts and the fostering of interest in and perpetuation of mechanical skills and craftsmanship.

ARTICLE III. The corporation does not afford pecuniary gain, incidentally or other wise, to its members.

ARTICLE IV. The period of duration of the corporations existence shall be perpetual.

ARTICLE V. The location of the corporation's registered office in this state is in the City of St. Cloud, Steams County, Minnesota.

ARTICLE VI. The names and addresses of the incoroators are as follows:
(Note: Personal addresses have been left out for security reasons)

<="" td="">

Bernick, Doris & John (son)	Bernick, Roy	Blanchard, Leroy & Joan
Bottomley, Sterling P.	Bromenschenkel, Jim	Dahl, Elmer
Davis, Kenneth	Hennen, Peter	Hunstiaer, Paul
Hunstiqr, Thomas	Kalenda, Robert L.	Klug, Dennis & Darlene
Leitheiser, Merlin	Liszka, Jr., Stanley	Marsioek, John
Maslowski, Albert	McKenzie, Allen	Merdan, Milt
McCoy, Forrest & Karen	Moline, Larry	Moline, Vera

Is the proposed co-op plan feasible?

- Convene a second exploratory committee with all interested members from the survey, presentations made on what info was gathered, and will vote on whether to proceed; if yes, then the Steering Committee will order a Comprehensive Feasibility Analysis; this analysis is done by an experienced practitioner who goes through all the plans, data, analysis, surveys, etc. and determines if the plan will work, along with suggesting changes
- If the practitioner signs off on everything, then it's time for an approval vote by all interested members and to elect a board of directors to take over from the Steering Committee
- This is a tight summary of how to get to this point – more meetings and more negotiations are likely going to be needed than what's written here; this may sound like a lot of meetings, studies, and info hunting... and it is – this is creating a brand-new business, possibly an entirely new marketplace



Feasibility Analysis/Study* – What?

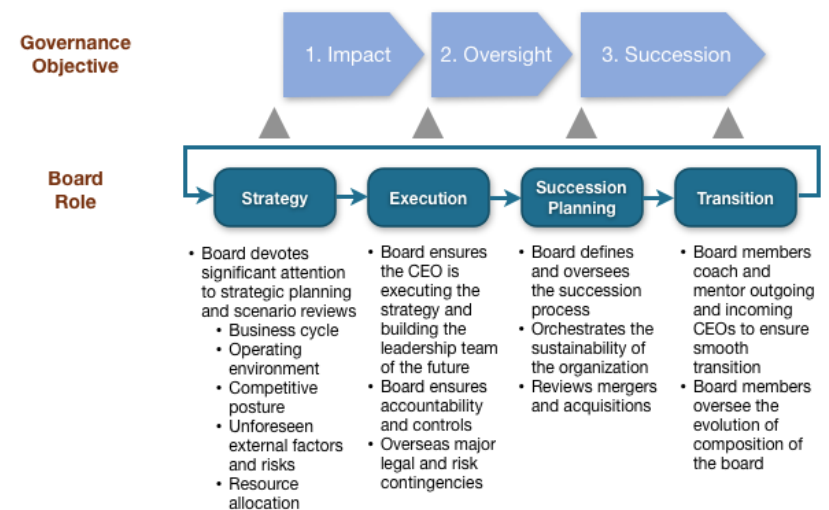
- Feasibility studies aim to objectively and rationally uncover:
 - The strengths and weaknesses of an existing business or proposed venture
 - Opportunities and threats as presented by the environment
 - The resources required to carry through
 - And ultimately the prospects for success
- Cost vs. Benefits – simplest criteria to gauge feasibility

Board of Directors

- If all members are on board to this point it's time to elect a board of directors to replace the Steering Committee
- In C and S corporations the board of directors comprises some of the largest investors and elected to the position by the other board members or preferred stockholders; in a cooperative the board is elected by the members only and is accountable to the members as shareholders; board members should at least be college educated, have three (3) years business experience, and required to complete a cooperative governance course up on election
- The board of directors accountable for all business activities, arranging all capital, signing all loan documents and leases, and hire all management staff
- All decisions of the board must be ratified by the votes of the membership; each decision presented line by line openly to the members and presented honestly; the members hold board elections either as needed or as term limits require

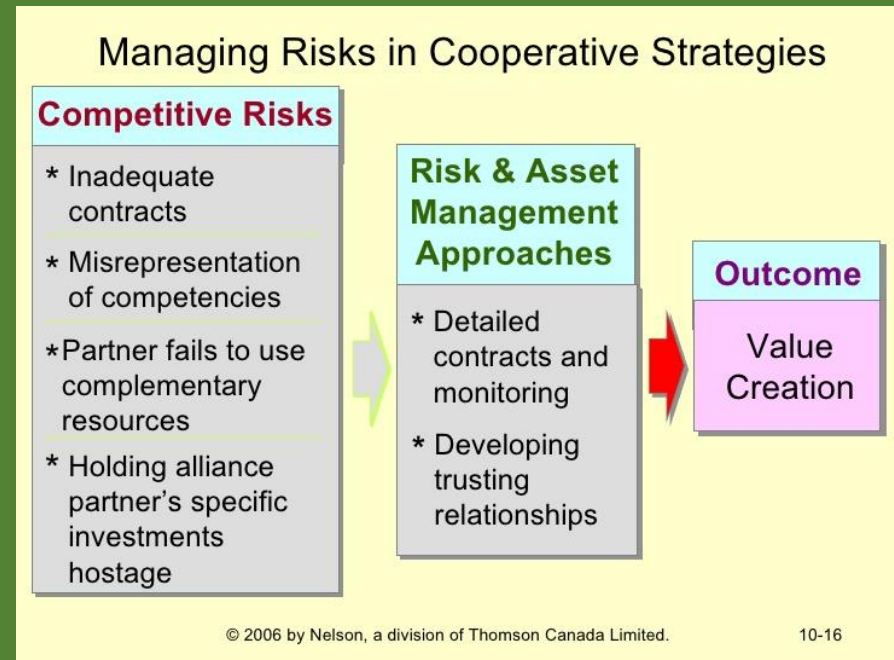


Top Responsibilities of Traditional Board of Directors



Do members commit capital and business volume (are resources available)?

- The board of directors are responsible for arranging all needed capital, equipment, and property; this is done by selling shares to members (equity) or borrowing funds (debt); try to avoid debt like the plague
- Members are expected to contribute more than just a small token investment – some will need to contribute time and talents for customer service or production, others may have needed equipment, etc. to making the venture successful; cooperatives are not pie-in-the-sky investments and returns can be sparse – especially at first; think of how a community garden would be planned and worked (everyone invested in a good harvest, regular attention given, austerity)
- Once sufficient capital is safely in the account, it's time to hire a manager, find a location (if necessary), obtain all needed equipment and stock, and if the plans called for it to hire employees from outside the member's circle... and start operations



Hiring a Manager

- When starting out it's best to hire a manager, an accountant, & possibly employees and grow from there – Adding a CEO, executives, and specialists is excessive weight at this point; the manager will need to handle all executive functions while the board oversees – this includes management, marketing, customer service, and possibly finance (would recommend against this and hiring a separate individual to do accounting)
- Hiring from among the co-op members is allowed and encouraged, but be cautious; there's old business wisdom warning against hiring one's friends and relatives; be sure everyone knows they must follow the rules, control emotions and personal feelings, attend all meetings and trainings, and do your personal best everyday
- If hiring from the pool of members, be sure the candidates have at least a Certificate of Completion in a Business/Finance course and/or two years of business management experience (Church callings likely won't count) with having three or more employees that reported to them; the board of directors should scrutinize each candidate and get member approval before extending an offer



Interview question checklist: Manager Edition

To identify candidates with the traits and skills that make for amazing managers, ask the following questions. To evaluate candidates fairly, ask all interviewees the same questions. Consider giving each answer a score out of five to help you compare candidates afterward.

TO GAUGE: Self-motivation “Tell me about a time when you overcame a setback.”	TO GAUGE: Substance “How do you continually hone and develop your expertise in _____?”
TO GAUGE: People-oriented “Do you feel more energized tackling a project alone or within a team?”	TO GAUGE: Productivity and focus “How do you prioritize your tasks?”
TO GAUGE: Passion for success for others “How do you reward hard work?”	TO GAUGE: Delegation skills “What steps or process do you follow when delegating tasks to team members?”
TO GAUGE: Result-focused “Tell me about a time when you lead a team to reach a particular challenging goal. How did you achieve results?”	TO GAUGE: Planning skills “What’s the first thing you do when developing a strategic plan for your department or team?”
TO GAUGE: Empathy “Tell me about a time when an employee came to you with a challenge or conflict. How did you handle the situation?”	TO GAUGE: Performance management skills “How would you give feedback to a staff member who was performing poorly?”

Top 10 Project Manager's Responsibilities

SCOPE MANAGEMENT

- Ensure that project requirements are elicited, analyzed and documented
- Ensure the project constraints, assumptions, and dependencies are documented and agreed upon
- Manage change requests



COST MANAGEMENT

- Develop project cost estimates and create a budget
- Track budget (capital, operating expense) and report on status

HUMAN RESOURCE MANAGEMENT

- Ensure roles and responsibilities for all project team members are clearly understood, followed, and communicated
- Ensure role assignments are filled with qualified staff



RISK MANAGEMENT

- Identify and quantify risks
- Develop risk mitigation strategies for each risk
- Communicate risks in a timely manner
- Complete periodic reviews of project risks and adjust approach strategies where necessary

STAKEHOLDER MANAGEMENT

- Identify and prioritize project stakeholders
- Create stakeholder register
- Manage stakeholder expectations



Hiring an Accountant/Bookkeeper

- Highly recommend hiring someone who does both accounting & bookkeeping when starting out, and then later hiring an employee as a bookkeeper to free up the accountant; hire around at the same time as hiring a manager
- An accountant will handle financial statements and entries, analyze operational costs, handle all IRS issues, help everyone understand the financial matters that will eventually come up, and enforces payment terms with the business accounts; a bookkeeper records all financial transactions, completes payroll, maintains ledgers, all balances, debit and credit transactions, and produces invoices

How to Hire a Bookkeeper: Questions to Ask #5

Will the bookkeeper have time for you or are they too busy?

Some bookkeepers don't have enough time to work on your accounting. Others are too busy during critical tax reporting periods.

Interview Questions for a Potential Bookkeeper



1

Do you have a staff of bookkeepers or do you work on your own?



2

Do you do bookkeeping part time or full time? Do you have a day job?



3

Will the completion of my bookkeeping be delayed while you are trying to meet tax deadlines throughout the year?



4

When can I expect to have my work completed?

Brought to you by: 5MinuteBookkeeping.com

10 Things to Look for when Hiring an Accountant

What You Get for Your Money

In Today's world Accounting professionals provide help with everything like bookkeeping to presenting document in a tax audit some question always floats in your mind like



Check Their References

Always take knowledge for client references from potential accountants & One thing to note is AICPA has links to all the state CPA registries One online tool National Association of State Boards of Accountancy is also available for references.



Do You Really Need a CPA?

CPA is commonly known as a certified public accountant & he must have college degree passed a full-time professional exam and have state licensing requirements. He has the power to take more responsibilities than other accountants



Find Out How Responsive They'll Be

Never ever place your finances in other's hand just to know about the adequate information. It is better to ask potential candidates regarding their turnaround time for filings and reports.



Shop Around:

It's a great idea to talk to at least three accountants or accounting firms before selecting one. Remind that professionals work for you; don't be anxious to ask questions and fully vet accountants who might handle an important form of your business.



Get Clear About Rates

Just make sure you know their fee structure and get the evaluation for the monthly costs for the services you need. Go over your budget and work out a contract that meets your demand without breaking the bank.



Ask for References from People whom you Trust

For better CPA you must ask colleagues and friends for referrals or it's better to refer online website of American Institute of CPAs (AICPA).



Know Your Own Bottom Line

Handing of books to an accounting professional & handling of full responsibility for the financial health both are different parts of your business.



How often they will connect

Clear, effective and continual communication is the key to a successful relationship with your accountant. Establish early on how regularly you'll connect, and how communication will be made.



Find out the value they can add to your business

An accountant will be enough to provide your business with far more value than easily completing your annual tax returns and generating your accounts



Tax-Exemptions for Co-ops

- Like any business entity there are fees to pay, licenses to obtain, and rules to follow; cooperatives are tax-exempt and this gives them a lot of advantages and some disadvantages; the line between tax-exempt activities and for-profit ventures is very well defined and must not be crossed
- If operating a retail cooperative, members and non-members would pay no Utah sales tax for purchases – prices posted would be prices charged
- The biggest drawback would be difficulties in obtaining credit for the cooperative; this would make operations small and limited until steady growth compounds, allowing for expansion; another negative (?) is limitations on political contributions and activism
- For more information, contact the State of Utah Division of Corporations & Commercial Code, and Utah State Tax Commission

<http://www.corporations.utah.gov>

<https://tax.utah.gov/business>

In Utah, the benefits of tax-exemption are:

- *Incorporation* provides a formal and perpetual means for sustaining programs undertaken initially by individuals. It creates formal procedures by which people can continue to carry out the purposes and to accomplish the goals of the founders.
- *Protection for Individuals* An individual's liability is limited. The corporation, not its members, is the entity responsible for debts. Also, the corporation, not its members, has the right to sue and to be sued, to hold property, and to enter into transactions.
- *Possibility of tax-exempt status* Non-profit corporations may be eligible for exemption from federal taxes, if they meet the requirements of the Internal Revenue Code {most will qualify under Section 501(c)}. Not all non-profits will be eligible. For example, a condominium association may be a non-profit corporation but it would not qualify for federal tax exemption.
- *Potential Incentive for Contributors* If your non-profit is granted tax-exempt status and can meet additional criteria, your donors and supporters may also be able to deduct their contributions to your organization from their personal income for federal tax purposes. Acquiring tax exempt status has proven helpful in creating incentives and in attracting support for non-profit corporation activities.
- *State Sales Tax Exemption* If you are granted federal tax-exempt status, or if you fall into the categories eligible under Utah law, you may also file for an exemption from the Utah state sales tax.



In Utah, the drawbacks of tax-exemption are:

- *Limits on your ability to borrow or obtain credit* If your corporation has no assets or sources of regular income, you will generally be required to find a personal guarantor of any debts incurred, in order to ensure payment.
- *Unwanted constraints on your activities* If you are granted tax-exempt status, you must follow certain rules on lobbying and political activity, as directed by the Internal Revenue Service. You may wish to consult these rules before applying for tax-exempt status, to decide whether these constraints are acceptable and compatible with your organization's purposes and activities.
- *Limits on your organization's purposes and activities* IRS rules also limit the purposes and activities of an organization if it wishes to retain its preferential tax status. The IRS must approve any changes from the original certificate of incorporation as a condition for continuing to grant the exemption
- *Imposition of management and record-keeping obligations* Non-profits are required to maintain certain records, conduct regular meetings and submit reports to federal and state agencies. These tasks may be more than your group wants to undertake.

ACCOUNTING TERMS

YOU NEED TO KNOW

Accounting professionals provide information that can affect an organization's decisions... so it's time to learn their language.



Bookkeepers generate data on an organization's activities.

ACCOUNTANT VS. BOOKKEEPER

Accountants turn data into actionable information.

Q WHAT ARE ACCOUNTS RECEIVABLE?

A The money that the business should receive from customers.

Q WHAT ARE ACCOUNTS PAYABLE?

A The bills and other debts that the business needs to pay.

WHAT ARE ACCOUNTING RATIOS?

Measurements of financial status and trends.

Liquidity ratios measure liquid assets vs. liabilities



Profitability ratios measure profit after expenses



Leverage ratios measure debt vs. assets



Turnover ratios measure cost of goods sold vs. inventory



WHAT IS GAAP?

Rules used to standardize accounting such as:



Measurement of financial activity



Disclosing financial activity



Summarizing financial information



Recording financial measurements

ROLES & RESPONSIBILITIES

in your Accounting Department



STAFF ACCOUNTANT

- Daily accounting tasks such as data entry, paying bills, invoicing, bank reconciliations, etc.
- Correctly inputs transactions into the accounting system
- Uses systems and processes, checklists, and other tools to ensure accuracy and thoroughness



ACCOUNTING MANAGER



- Understands financial accounting in-depth including all accounting requirements, GAAP rules, accrual accounting, etc.
- Oversees and reviews the Staff Accountant's work
- Implements operational efficiencies and documents standardized procedures
- Produces accurate, timely financials

CONTROLLER

- Distributes and reviews financial statements with management/ownership
- Translates the story told by the numbers
- Responsible for forecasting, budgeting and benchmarking
- Communicates metrics and Key Performance Indicators (KPIs) through charts, graphs, and trend analysis



CHIEF FINANCIAL OFFICER (CFO)



- Acts as a coach and adviser focused on discussing and supporting the goals of the business
- Focuses on strategy, financing, M&A transactions, high-level analysis, capital expenditure decisions, and, most importantly, provides financial leadership
- Oversees both accounting and finance along with finalizing budgets, forecasts, or financial recommendations

Read more at <https://tgg-accounting.com/ideal-accounting-department/>

Becoming a Certified Bookkeeper

Accrediting Agencies

National Association of Certified Public Bookkeepers

American Institute of Professional Bookkeepers

Certification Tests

Accounting Training Unlimited:

- Analyzing business transactions
- Payroll computations
- Financial statements and more

Prometric:

- Revenue recognition concepts
- Federal reporting
- Fraud prevention and more

Necessary Skills



End-of-period Adjustments



Bank Reconciliations



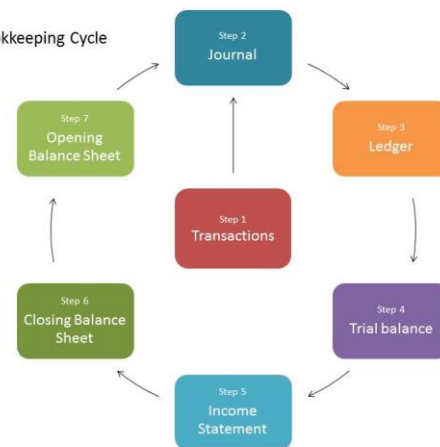
Payroll Processing



Depreciation Records

the balance

The Bookkeeping Cycle



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No.	Account Title	To Increase	Description/Explanation of Account
101	Cash	Debit	Checking account balance (as shown in company records), currency, coins, checks received from customers but not yet deposited.
120	Accounts Receivable	Debit	Amounts owed to the company for services performed or products sold but not yet paid for.
140	Merchandise Inventory	Debit	Cost of merchandise purchased but has not yet been sold.
150	Supplies	Debit	Cost of supplies that have not yet been used. Supplies that have been used are recorded in Supplies Expense.
160	Prepaid Insurance	Debit	Cost of insurance that is paid in advance and includes a future accounting period.
170	Land	Debit	Cost to acquire and prepare land for use by the company.
175	Buildings	Debit	Cost to purchase or construct buildings for use by the company.
178	Accumulated Depreciation – Buildings	Credit	Amount of the buildings' cost that has been allocated to Depreciation Expense since the time the building was acquired.
180	Equipment	Debit	Cost to acquire and prepare equipment for use by the company.
188	Accumulated Depreciation – Equipment	Credit	Amount of equipment's cost that has been allocated to Depreciation Expense since the time the equipment was acquired.

Hiring Employees

- Members should provide as much labor as they can to keep costs low; however, hiring employees would free up member's time to pursue their own careers and goals; best to consider this with the exploratory committee before starting
- Benefits for hiring outside the membership circle is the possibility of expanding membership, bringing in new talents and skills the groups doesn't possess, and opportunities for advancement is much higher
- The downside is wage compensation and benefits package (if any) would likely be smaller and limited compared to for-profit companies; when starting out there may not be any benefits package due to available capital, but that can change with steady growth



THE 8 HABITS OF HIGHLY PRODUCTIVE PEOPLE

Habit 1: Ruthlessly cut away the unimportant
(and Focus on the important)

Habit 2: Allocate breaks strategically
(Rest when you are tired)

Habit 3: Remove productivity pitstops
(Things that limit your productivity)

Habit 4: Tap into your inspiration
(Channel your inner muse)

Habit 5: Create barriers to entry
(Don't make yourself too accessible)

Habit 6: Optimize time pockets
(Make the best of every minute)

Habit 7: Set timelines (So things get done)

Habit 8: Automate everything possible
(Outsource, Delegate, Automate)

© Celestine Chua; Full article at:
<http://personalexcellence.co/blog/habits-of-highly-productive-people/>

13 PERSONALITY TRAITS OF A DISENGAGED EMPLOYEE



BONUS

DISENGAGED EMPLOYEES DON'T SUPPORT A GOOD COMPANY CULTURE

They don't understand how much of a role company culture plays in the success of the business. Any employee that's not willing to help improve the company culture should be let go, because they will be a drain on the rest of the team.

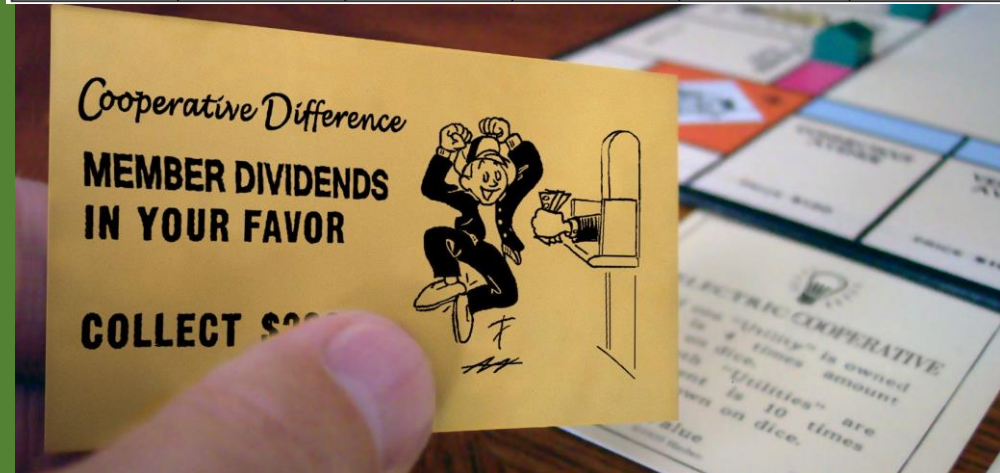
Tools like Officevibe help to organically build a better company culture, by building better habits into the team.

Improve Your Workplace Today. Learn More at www.officevibe.com

Member Dividends

- Depending on how the by-laws are written, members will receive dividends of the margins
- This is not a quick path to riches – more of a stipend to keep members interested in continuing the venture; the more the cooperative grows and is used by members and non-members the more the dividend will grow
- This dividend is taxable, so plan for that accordingly
- The cooperative entity should retain some of the dividend for growth, business diversification, and inflation; this prevents the need for members to reinvest their share

A: Total Member Purchases	B: Your Co-op Purchases	C: Your Share Of Total Member Purchases (B / A)	D: Total Patronage Dividend	E: % Of Dividend For Rebate (the rest is retained by Co-op)	F: Your Rebate From Dividend (C x D x E)
\$9 Million	\$2,600	.029%	\$375,000	40%	\$43.33



PATRONAGE DIVIDENDS



TYPES OF UTILITIES



INVESTOR-OWNED
Privately owned by
shareholders/investors
Operate for a profit



MUNICIPAL SYSTEMS
Owned by cities,
counties, or states
Not-for-profit



COOPERATIVE
Owned and operated by
the people they serve
Not-for-profit

When you sign up
for service with

Electric Cooperative,
you become a
**COOPERATIVE
MEMBER**



WHAT ARE PATRONAGE DIVIDENDS

1

MVEC tracks the electricity
and/or communications
services you use and how
much money you pay for it
throughout the year.

2

We pay for things like
maintaining and improving
our electric system, and fiber
network, emergencies and
natural disasters

3

At the end of the fiscal year,
the directors determine if
there are excess revenues,
called margins.

4

The cooperative allocates
those margins to members as
patronage dividends based
upon their electric and/or
communications bills.

5

The directors elect to
retire, or pay, the patronage
dividends when our financial
condition permits.

HOW DO I RECEIVE MY PATRONAGE PAYMENTS

CHECKS ISSUED

Members or former members:
*Checks will normally not be issued for an
amount under \$5.00. Retired amounts
under the \$5.00 minimum will be held by the
Cooperative until the member's cumulative
retired patronage balance reaches \$5.00.*

	Maquoketa Valley Electric Cooperative <small>By "Your Sustainable Energy" Cooperative</small>	DATE <u>xx/xx/xx</u>
Pay to the order of	<u>MVEC Member</u>	<u>\$Amount</u>
<u>Amount here</u> Maquoketa Valley Electric Cooperative		

Search our list of unclaimed capital credits at
mvec.coop/patronage-dividends or
greatiowatreasurehunt.gov
to see if anyone you know is owed money from
Maquoketa Valley Electric Cooperative!

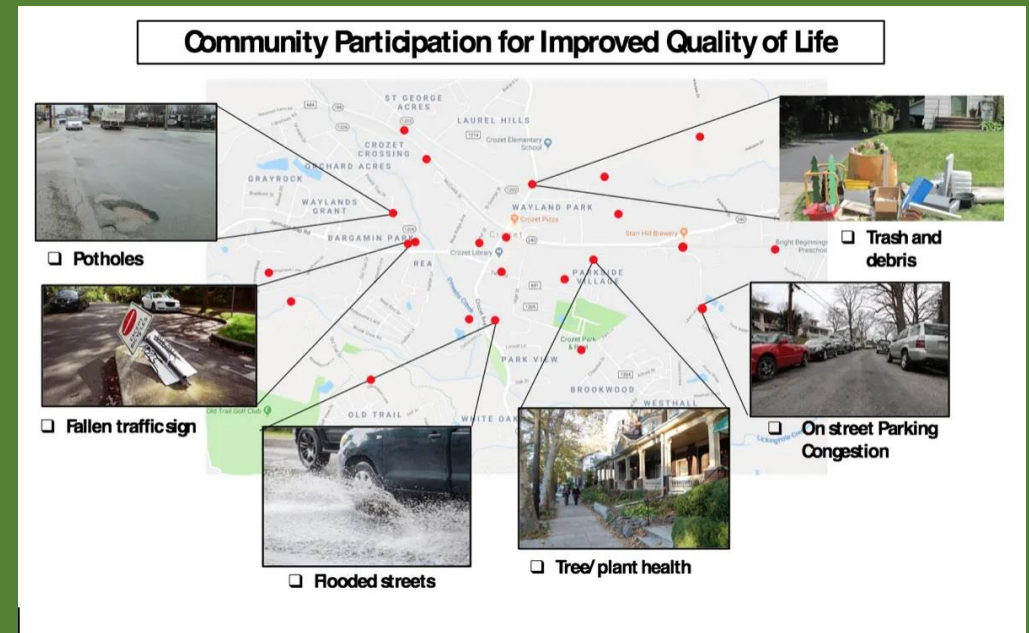
Continuing Education and Training

- A drawback that strikes cooperatives is inability to perform needed tasks and misinformation: a lack of skilled management and employees, and uninformed members voting for moves and changes that hurt rather than help; members must arrange for training workshops and, when possible, send some members for formal education to perform managerial or skilled jobs
- Education and training can be something like a quick research lecture to a week long training workshop (some of these trainings are offered by the Church Employment Center); if growth necessitates more management, or more skilled labor the co-op can send prospective members to SLCC for certifications or degrees (Deseret Industries could help with this – best to ask if they can help share costs)



Community Outreach and Improvements

- One of the best ways to keep the community interested and participating in the cooperative is for the cooperative to take an interest in and participate in improving the community first
- A small percentage of retained profit margins can go to community improvements in such basic things like installing more street lights, pothole repairs, more trash and debris removal; or for greater matters like emergency assistance and disaster recovery
- The more a community experiences and knows the cooperative will support the community, the more participation is likely to occur



Church Publications & Websites

Publications

- “All Is Safely Gathered In; Family Home Storage”
- “Home Production and Storage”
- “Basic Self-Reliance”
- “Providing the Lord's Way”
- “Basic Principles of Welfare and Self-Reliance”
- “My Path to Self-Reliance”

Websites

- Gardening website
[.https://www.lds.org/topics/gardening?lang=eng](https://www.lds.org/topics/gardening?lang=eng)
- Provident Living website
[.http://providentliving.org/?lang=eng](http://providentliving.org/?lang=eng)
- LDS Charities website
[.http://ldscharities.org/?lang=eng](http://ldscharities.org/?lang=eng)
- BYU Independent Study
[.http://is.byu.edu/courses/pe/999053071002/public/start.htm](http://is.byu.edu/courses/pe/999053071002/public/start.htm)
[.http://is.byu.edu/courses/pe/999053072002/public/start.htm](http://is.byu.edu/courses/pe/999053072002/public/start.htm)